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CAPITAL GOODS INDUSTRY IN DEVELOPING COUNTRIES: A SECOND WORLD-WIDE STUDY

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DIVISION FOR INDUSTRIAL STUDIES

Main results of the study work on industrial sectors are presented in the Sectoral Studies Series. In addition a series of Sectoral Working Papers is issued.

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

Preface

The present study has been prepared by UNIDO's Division for Industrial Studies, Sectoral Studies Branch, with the aim of assessing the present world situation of the capital goods industry and to present some issues for the further development of this industry especially in developing regions. A second volume of the study (UNIDO/IS.505), contains statistical data and estimates complementing the present volume.

This volume consists of two parts. Part one presents the world situation in the capital goods industry, with focus on the developing countries, and aims at giving a background to the issues to be discussed at the Consultation Meeting. Part two presents the main results from an extensive regional survey work issued separately in different UNIDO documents. The second part discusses strategies and policies that have been adopted in the various regions as well as strategical options for the development of a domestic capital goods industry in those regions.

UNIDO's internal information systems and data bank have been the main sources for this study.

The study will serve as background document to the Second Consultation on Capital Goods, Stockholm, 10 to 15 June 1985.

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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.

A slash between dates (e.g., 1980/81) indicates a crop year, financial year or academic year.

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

Metric tons have been used throughout.

The following forms have been used in tables:

Three dots (...) indicate that data are not available or are not separately reported.

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 Units (SI), the following abbreviations and contractions have been used in this report:

Economic and technical abbreviations

CNC	Computer numerically controlled
NICs	Newly industrializing countries
GDP	Gross domestic product
GNP	Gross national product
IDDA	Industrial Development Decade for Africa
ISIC	International standard industrial classification of all economic activities
MVA	Manufacturing value added
NES	Not elsewhere specified
R + D	Research and development
SITC	Standard International Trade Classification
CPE	Centrally planned economy
GW	Gigawatt
MW	Megawatt

Organizations

ASEAN	Association of South East Asian Nations
ECA	Economic Commission for Africa
ESCAP	Economic and Social Commission for Asia and the Pacific
ILO	International Labour Organization
OAU	Organization of African Unity
UNCTAD	United Nations Conference on Trade and Development
ECLAC	Economic Commission for Latin America and the Caribbean

PART ONE

THE PRESENT WORLD SITUATION IN THE CAPITAL GOODS INDUSTRY

1. SUMMARY AND CONCLUSIONS

Capital goods are an extremely heterogenous group of products that play a central role in the industrialization of the developing countries. The present study presents an assessment of the situation of this industry. Naturally, the basic question is "What is to be done?" i.e. what strategies can be followed by the developing countries if they are to develop this industry. However, the heterogeneity of both the sector and the developing countries precludes generalizations about strategies to a large extent.

Manufacture of capital goods covers a wide segment of products. Its level in a country is indicative of critical stages in the industrial and technological growth and is basic for the development of skills. The following statements would seem to be generally valid:

(a) Domestic production of machinery depends on investments in capital goods manufacture and the availability of technical know-how.

(b) The production of many capital goods, is fairly capital intensive involving a long gestation period during which skills are acquired. The manufacture of basic industrial components is often relatively labour intensive but requires the output to be of high quality.

(c) Investments in machinery manufacture can be gradually extended in phases to increase the local content.

(d) The extent and period of phasing constitutes a critical aspect for the growth of a technological base. An important aspect is the choice of products and technology for each stage.

(e) Capital intensive and complex technologies may not be appropriate to conditions in developing countries with no capital goods base or for countries where the base is still unbalanced.

1.1 Central issues in developing the capital goods industry in developing countries

Three central policy issues connected to the development of the capital goods sector, will be briefly discussed here:

(a) Entry into the production of simple capital goods;

(b) Technological issues; and

(c) International co-operation.

1.1.1 Entry into the production of simple capital goods

The specific needs of individual countries require different emphasis in the development of the indigenous capital goods industry. There is considerable variation in the relative development models of the capital goods industry in developing countries. Some have achieved self-reliance or are set to do so in the near future. A number of countries have accorded priority to the manufacture of certain specific categories of machinery.

For the developing countries the answer to the following question is very important: When should the capital goods be produced domestically and when should they be imported? If the decision is made to produce rather than import - under conditions where the capital goods sector does not enjoy international competitiveness - then, other questions arise regarding the best policy of isolating the domestic production from the external competition and regarding consequences for those domestic industries that use so produced capital goods.[1/]

1/ See, Fransman, M. (Ed.), Machinery and Economic Development, London, 1985 (forthcoming), p. 3.

As many of the countries have a large agricultural base, the entry into the capital goods sector could be started from simple machine and tools manufacturing processes. The conditions for entry would depend on natural resource endowments, and the infrastructure and skills available. It would also be dependent upon the policies to attract and generate investible resources for the start and establishment of the production of simple producer goods.

The essential pre-requisite is the establishment of engineering and development capabilities and increasing the skills of the labour force. To begin with some of the plants may have to be imported in countries with an embryonic engineering industry and during the apprenticeship period facilities would have to be built up for their maintenance, repairs and renewal. There is need for training in design, adaptation and development. The objective is to make locally capital goods utilizing specialized production and multi-purpose units chiefly related to agricultural implements, equipment and machinery common to all production. The organization of the productive apparatus including the technical mastery of technology here plays an important role.

For common capital goods entry is not so difficult particularly for products with simple or low technology requirements.[2/] Nonetheless, appropriate government policies for developing the infrastructure and

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2/ "Entry into the production of relatively simple capital goods is fairly easy for most developing countries. The reason is the 'technological convergence' that exists between the metal-working and machine-producing sectors. In other words, in the case of relatively simple machinery such as some kind of agricultural implements, or conventional machine tools, the technology, including skills, required to produce the machine is similar to that used in the metal-working sector. For this reason in most developing countries with a capital goods sector, the largest number of firms in the sector originated from the transfer of human and material resources from the metal-working sector. Typically, embryonic capital goods sector firms begin by manufacturing spare parts and components for machinery before moving on to produce complete, but relatively simple, machines". See, Fransman, M. "Conceptualizing technical change in the Third World in the 1980s: An interpretative survey": Journal of Development Studies, forthcoming July 1985, p. 43.

strengthening the techno-managerial capacity of firms engaged in these fields are necessary. Engineering capacity must be developed as it is indispensable for dealing with problems of job lot production. Although domestic capacity to design complex capital goods is the basic long-term objective, high technology capital goods cannot be made without mastering the basic elements of manufacturing technology. Therefore, a technology policy to ensure sufficient conditions for the advancement of technological autonomy is called for. Furthermore, as many of the developing countries do not have the requisite skills, large markets, technological base and infrastructure, there is a need for sub-regional and regional co-operation.

1.1.2 Technology issues

Domestic capital goods production is a sine qua non for industrial progress. It promotes the emergence of specialized skills and indigenous capability, both in the machine building industries and in a large number of medium- and small-scale supplier units which can be usefully linked to such production. At initial stages these skills and capabilities may be somewhat low. But this is an essential phase in technological growth and creates the necessary base for a highly diversified engineering goods production, specialization in manufacture and effective design capabilities.

The capital goods sector occupies a special role as far as the technical issues are concerned. "The reason is that this sector lies at the heart of the process of technology generation and diffusion."[3/]

Many linkages are considered in the technology issues related to the capital goods sector: the relationship of capital goods suppliers to users, on the one hand, and component producers on the other in the machine tools sector; the influence of competitive pressures and informations flows in both internal and external markets; and the influence of the State.

Moreover, the factors underlying previous redeployment of some industrial sectors to developing countries now seem to be affected by the increased

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3/ See, Fransman, M. (ed.), op.cit., p. 40.

automation of production processes in the industrialized countries. On the one hand, the introduction of labour saving technologies in some industrialized countries has increased the pressure for protectionist barriers, beginning in the most labour-intensive sectors (e.g. garments) and now spreading to other consumer (e.g., cars and television) and intermediate goods (e.g. steel). On the other hand, the downstream use of microelectronics in other sectors has begun to undermine the comparative advantage of developing countries producing with traditional technology and low-wage labour. Examples of such trends are the automated insertion of integrated components onto printed circuit boards, the packaging of the circuits themselves, the reduction of the number of circuits in many products, etc.

It seems, therefore, that the redeployment process which has been a major element in speeding up the industrialization of developing countries is undergoing drastic changes. The increasing application of high technologies in industrialized countries will accelerate this process. The developing countries must find adequate responses to the changing conditions, above all in the development of their capital goods industry.

The technology policy implies the formulation of concrete plans which need to be formulated and implemented to strengthen the engineering and the existing scientific and technological infrastructure, especially manpower training with special attention to design capabilities. Special attention should be given to the terms of contract negotiations and to the progressive stages leading to the local manufacturing of spare parts, components and complete machines. The gathering, retrieval and dissemination of technical information must play an important role in the implementation of this policy.

The machine tool industry is of critical importance in capital goods technology. It covers a wide range of equipment for metal cutting and metal forming and varies in technical complexity. In developing countries with no capital goods industry and also in countries with only an embryonic base products and technology have to be very carefully selected in order to avoid initially highly complex technologies which cannot be readily absorbed. Experience in machine tool manufacture shows that in countries where there is an adequate growth of technological infrastructure, technology acquisition through licencing may be desired to entry into further stages of technological

complexities. At this point, it is necessary to distinguish between the decision to produce capital goods locally and the decision to design capital goods. "The making of capital goods does not necessarily imply the designing of such goods. In fact, in the newly industrializing countries of Asia and Latin America capital goods design tends on the whole to be imported from the highly industrialized countries."[4/]

Further it has been said that "although design capabilities have been developing in the countries surveyed (India, Brazil, South Korea), these tend to be in the area of detail design rather than in the more fundamental area of basic design. As a result design capabilities are still rather limited thus restricting the more dynamic contributions of the machinery sector in these countries. One of the reasons for the limited development of design capabilities is the successful attempt made by foreign companies to restrict the transfer of such capabilities in their licensing agreements".[5/]

1.1.3 International co-operation issues

There is considerable scope for co-operation among developing countries in order to give a wider spread to the manufacture of capital goods. Developing countries which already have a base for capital goods manufacture could assist in the transfer of technology by entering into joint ventures with other developing countries where such facilities are required to cater to national, sub-regional, or regional needs.

If manufacturing and trade of capital goods could be established on a sub-regional or regional basis, the region or group might be able to negotiate more equitably in the competitive international marketing environment. The sub-regional and regional groupings can help in the transfer of technology to the producer goods industries on a largely unpackaged basis. The combined strength of the sub-regional or regional groupings may be able to negotiate the best terms for royalties, patents, licensing, technology transfer and capital investments.

4/ Op. cit., p. 3.

5/ Ibid., p. 4.

Small countries individually are hardly in a position to match the vast capital and human resources of transnationals who are well entrenched in the capital goods sector.

Import of intermediate technology from the newly industrializing countries would also go a long way in promoting the growth and development of some of the basic and core industries at the sub-regional and regional levels and would be more in keeping with the labour intensive orientation suitable to many countries with no or embryonic engineering industries. International co-operation may be able to distribute the risk burdens by matching sectoral attempts at technology generation and harmonization. A regional centre for acquisition of technology for the capital goods sector can be a potent factor to help the developing economies acquire technology at internationally competitive prices largely in unpackaged form.

1.2 The need for action programmes

The concept of industrialization and capital goods strategy implies the need for a positive action-oriented programme. In order to generate employment and income such a strategy should involve an expanded role for the small and medium industry and would depend more on the optimal use and creation of domestic resources.

It is very important to provide for the backward linkages and create the necessary infrastructure in terms of raw material and components support, power availability, availability of process inputs, development of technological and engineering skills and co-operation in research and development.

National policies have been an important determinant of capital goods manufacture in developing economies. These range from fiscal incentives, participation and assistance for purchase of domestically produced equipment, import control and tariff protection. Policies on foreign ownership and technology also have an impact and in some countries public sector machinery manufacturers have been given special treatment. There has been little assessment of suitability of particular machine building technologies except by user units.

Government and planning authorities should make a detailed assessment of various capital goods and identify the products and sub-sectors in which indigenous manufacture is to be started. Investments have to be attracted by various means. Technology should be carefully selected to suit the objectives. Terms of technology transfer will require detailed negotiations indicating levels of integration spread over time. Greater policy emphasis is required on growth of skills in management, marketing of machinery and in design and engineering and R and D activities in the capital goods sector.

The government has to facilitate the development of local skills and participation and creation of a congenial environment through support of research and development, credit facilities, technical-vocational education, sectoral and national plans geared to the establishment of producer and core industries. This strategy envisages an expanded role for the small and medium size industry which can assist in the growth of the core and producer goods industry. Small and medium size industry is increasingly being associated with appropriate technology.

A very close and meaningful relationship between national and sectoral strategies needs to be established so that the national economic plans have an integrated linkage with the sectoral strategies and the two are leading towards accelerated industrial growth and development of the engineering and other capital goods industries. The industrial and national plans will have to stress building up a capital goods base and integrating it with other sectors.

Individual developing countries would need to adopt appropriate national and sectoral integrated strategies to achieve their own industrial and social goals. Each developing country has to ensure that the nature and extent of its national and sectoral linkages contribute most to the fulfilment of the industrialization objectives and the setting-up of a capital goods base. Among the developing countries the NICs have broadly followed the national strategies for industrialization with emphasis on building up the capital goods.

It is necessary to undertake in the first place an inventory of the capital goods requirements in individual countries as well as at sub-regional and regional levels and to identify the areas in which production facilities could be established in an individual developing country. This calls for an in-depth industry/market survey. Due consideration has to be accorded to such factors as constraints of resources, availability of technologies, and the maturation period involved in creating the manufacturing facilities. Interaction encompassing operations in production planning, development, financing, transfer of technology and trade is needed.

2. THE NEED FOR A BROAD DEFINITION OF CAPITAL GOODS

Attempts to describe the capital goods industry in terms of product categories, compatible with existing empirical data have frequently posed major conceptual difficulties in economics. The presentation of an inclusive and exclusive definition of capital goods presents a special challenge. Consequently, various analyses of the capital goods industry have not been consistent in their definition of the industry and have been based on differing outlooks.[6/]

Diversity and heterogeneity are characteristic of the capital goods sector. It is estimated that the number of different goods that can be classified as capital goods is close to four million. These goods differ from each other with regard to their process of production; the structure of production and degree of finish when moving downstream in the production process; their degree of complexity; the functions they perform (e.g. supplying energy, transmitting energy, control and regulation, and structure); their use (the whole spectrum from multipurpose universal machines to machines performing very specific and specialized tasks); and their end-use destination (all sectors of the economy from agriculture to service are supplied by capital goods of varying types in one way or another whereas some capital goods are common to all branches of industry). Reflection on these facts makes clear the bewildering diversity and heterogeneity of the goods produced by the industry. Yet, these diverse and heterogeneous products are related to each other in various economic systems by their contribution to the integrated activities of the production branch of that economy and by technical and economic interdependencies.

Capital goods require numerous inputs that increase with their complexity. Thus, an analysis of the input/output tables of the United States of America reveals that the manufacture of metal-cutting machine tools

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6/ For a discussion see Frances Stewart, "Technology and underdevelopment", Westview Press, Boulder, Colorado, 1978.

requires direct inputs from 47 industries and, if one takes the necessary infrastructure into consideration, the number of industries serving the machine tools production increases to 56. For the agricultural machinery and equipment industry this number is 31, for metal containers manufacturing it is 20.

Looking at the capital goods from the point of view of end-use we may distinguish the following main subsectors:

(a) Capital goods for the production of capital goods (i.e. machinery and equipment which are used for manufacturing within the capital goods sector itself; this means primarily machine tools and related automation systems. In a broader context, construction and public works machinery and equipment falls also into this category);

(b) Capital goods for the production of intermediate goods (e.g. electric power production and distribution equipment, iron and steel making equipment, mining and ore processing equipment, petrochemical, fertilizer as well as other chemical industry equipment);

(c) Capital goods for the production of consumer goods and services (e.g. machinery, equipment and implements for agriculture,[7/] equipment for food processing, textile, footwear, leather, electrical consumer goods industries, etc.).

If we look at the capital goods in more detail from the point of view of the nature of demand that they satisfy, we may distinguish between capital goods intended for a single user sector, those intended for several production sectors, and those that can be used in almost all sectors.

The agricultural machinery industry is one of the examples of capital goods destined primarily for a single sector. Also belonging to this category are specialized industrial equipment and plants for the petrochemical, iron

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7/ It should be noted that agriculture may be considered as a mix of activities producing both consumer and intermediate producer goods (e.g. raw materials for textile, rubber and other industries).

and steel, food processing, and construction sectors as well as for electricity generation, transmission and distribution. Here, unless export orientation comes into the picture, the production of such single demand capital goods is directly linked to the demand of the particular user sector. Obviously, through indirect demand and industrial linkages the goods often serve a wide variety of sectors indirectly. This is especially true of electrical power equipment.

Capital goods intended for several production sectors include, for example, cranes, equipment for automation, metal forming (foundry, forging), protection, painting, storage and transport, etc. Such more general purpose equipment can be used in industries like energy, chemicals and metallurgy.

Capital goods intended for numerous sectors perform functions common to all branches, including:

(a) Industrial production functions: e.g. frames for industrial buildings, measuring and control equipment, machine tools, motors, compressors, screws, tools, etc.;

(b) Transport, storage and handling functions: e.g. trucks, containers, storage equipment;

(c) Management and data processing functions such as computers.

It can be seen that goods common to all branches range from semi-products, tools and simple machines (motors, compressors) to rather complex machines like machine tools and computers. The economic importance of this category is quite considerable since they represent about 40 per cent of the total value of all capital goods produced. It should be noted, however, that it is difficult to establish a precise boundary between this and the previous category (capital goods for several sectors) since the technical characteristics of the capital goods classified as common to all branches can vary for the same type of product according to the specific requirements of the client branches.

The extreme diversity makes an ordering of capital goods necessary. Otherwise attempts at analyzing the industry and arriving at recommended strategies and plans of action will either be impossible or will descend to the level of generality so broad that it would be of little practical use. Arriving at a classification scheme that would allow one to achieve some order of this diversity is of great importance.

The search for an acceptable definition and classification of capital goods must focus on the distinctive feature of these goods. The distinctive feature of capital goods is that they cause the reproduction and expansion of the stock of economic wealth and the flow of income through their contribution to gross fixed capital formation. Thus, they fulfil the economic function of capital investment. A subset of the capital goods industry is required in the production of itself and in the production of other means of production. This is the core of the capital goods industry with machine tools constituting a dominant portion. According to this definition, the capital goods are concentrated in and constitute a part of the metal-converting (mechanical, electrical, transport and engineering) industries. The metal-converting industries, in addition to capital goods, produce intermediate goods and durable consumer goods.

Unfortunately there is no correspondence between this definition of capital goods and the world standard industrial and trade statistics classification schemes (ISIC and SITC).[8/] In the international industrial statistics, capital goods are concentrated in ISIC class 38, "Manufacture of Fabricated Metal Products, Machinery and Equipment", with five subclasses, numbered from 381 through 385. In the international trade statistics, Revision 2, capital goods are concentrated in SITCs 69, 7 and 87. In Revision 1, they are concentrated in SITCs 69, 7 and 861. This, then, constitutes the operational definition of capital goods adopted in this study.

8/ See appendix 1 for a listing of ISIC and SITC codes encompassing the capital goods sector.

3. THE ROLE OF CAPITAL GOODS IN THE INDUSTRIALIZATION PROCESS[9/]

It is not only the volume and value which makes the production of capital goods so important, but also the key role that capital goods play in the industrialization process. The machinery and equipment part in fixed capital formation plays a decisive role in the process of capital accumulation. At the same time the capital goods industry produces the means of production and is a catalyst for technological progress. Since the development of this industry involves mastering a wide range of technology and expertise, it also promotes innovations and innovative approaches.

Beyond this it is clear that without a capital goods industry the developing countries cannot emerge from dependence even if they would achieve the rate of industrial growth corresponding to the objectives of the Lima Declaration. In fact, dependence will be accentuated if the development of their industrial fabric is allowed to depend exclusively on the industrial and technological centres of the industrialized countries. Internal integration of the industries, and even sub-regional integration, will be almost impossible. Thus, the effect of the capital goods industry on the international division of labour is another aspect of its vital importance.

Under the stimulus of technical progress and in particular under the impulse of the widespread use of automation, a differentiation has taken place in the industrialized countries between, on the one hand, the consumer goods and intermediate goods industries, and on the other hand the capital goods industries and the specialized design companies (engineering, management and maintenance) which are increasingly linked to them. The former is characterized by the widespread use of continuous production processes, work stations and unskilled labour, whereas the latter exhibits a polarization of skilled labour.

9/ See, Pack, Howard, Fostering the capital goods sector in LDCs: a survey of evidence and requirements, World Bank Staff Working Paper, No.376, Washington D.C., 1980.

It is on the basis of this social division which operates in the industrialized countries that possibilities for a new international division of labour have been discussed: the industrialized countries could specialize in capital goods industries, specialized service companies and research centres, whilst the consumer goods and intermediate goods industries, having been largely dispossessed of their software activities and their skilled labour, could be transferred to the developing countries with less of a challenge to the international division of labour.

Thus, it is around the capital goods industry that the principal challenge of the new international division of labour is located, and it is around this same industry that competition is becoming more intense in the industrialized countries for exports to the South. It is also here that the outcome of the struggle for reduction of developing countries' technological and economic dependence will be centred.

As there is no standard statistical nomenclature for capital goods, it is difficult to estimate their production precisely. Therefore, world production of capital goods in value added terms can be estimated only approximately at about forty per cent of the world's manufacturing production.

The imbalance between the developing and developed countries is evident in the low contribution of the former to the world production of capital goods (approximately 6 per cent) compared to the developed countries. The developing countries' share of world exports of capital goods is only about 3.5 per cent, whereas their share of imports reaches approximately 30 per cent. This deep-seated imbalance is accompanied by other imbalances between the developing countries themselves. Machine-tool production in developing countries is concentrated in about 10 countries. Moreover, Brazil and the People's Republic of China account for over half this production.

The new forms of dependence in which the new international division of labour encloses the developing countries through capital goods have been formulated by the Interfutures Report in a paragraph on the high technology industries: "Whatever their development strategies, the Third World countries will have to expand their investment and, consequently, increase the volume of

their capital goods requirements. Yet in 1973 their share (excluding the People's Republic of China) in the manufacture of machinery was no more than 3 per cent of the world total. By the end of the century this could have risen to 13-14 per cent. The developed countries of the West and East will therefore probably retain their high level of specialization in this branch, whose growth should offset, at least in part, their relative decline in the traditional industries. This phenomenon could be even more pronounced with regard to industrial machinery. As for the Third World it will probably increase its imports of capital goods from the North substantially. To a large extent technology is incorporated in production goods. Consequently, the capital goods content of international trade is going to be decisive in shaping the forms of industrialization of the developing countries."10/ International trade is therefore seen as a mechanism orienting and modelling the industrialization of the developing countries in a decisive manner.

The capital goods industry, by its direct action and the indirect measures necessary for its implementation and by its unique position in being linked directly to virtually all sectors of the economy, is a motive force in development and an engine for technological growth. It creates the conditions not only for operating the industrial system but also for the self-reproduction of this system.

The establishment of a capital goods industry is one of the essential conditions for avoiding pseudo-transfers of technology - that is to say, the use of technology without its assimilation. Because its mastery implies the domination of a wide range of technologies, the capital goods industry and the engineering infrastructure which is associated with it make it possible to move away from the path of purely copying and opens up the route to the creation of local innovative capabilities. The establishment of the industry is one essential condition for the realization of more appropriate

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10/ Organization for Economic Co-operation and Development, "Facing the future: mastering the probable and managing the unpredictable", Interfutures Report, p. 266, Paris, 1979.

technologies for the South. Such technologies incorporating less fixed capital are not generally produced in the industrialized countries, and there is little chance that they will be in the near or medium-term future. This task can therefore only be assumed by the capital goods industries in the developing countries themselves. To use Schumpeter's terminology, the creative destruction of existing imported and inappropriate capital stock cannot be achieved by the importation of even more inappropriate capital stock. It must be done through the local capital goods sector.

The quantitative importance of the service and design activities in the capital goods industries, should be emphasized. Normally, in terms of the number of jobs, these service and design activities account for 25-30 per cent of the total jobs in the capital goods sector. In the consumer goods and intermediate goods sectors, these activities are in general much lower, representing only about 10-15 per cent of the jobs.[11/]

Software activities develop as a function of the complexity of the capital goods being produced in an economy. This development is carried out through:

- Diversification of design and R and D activities;
- Diversification of production organization activities involving methods, planning and supplies;
- Diversification of technical support activities;
- Diversification of quality-control activities; and
- Diversification of marketing and engineering of demand activities.

11/ IREP, Université des Sciences Sociales de Grenoble, "Transfer of technology and engineering in the capital goods industry", February 1980.

The quantitative and qualitative importance of software activities in the capital goods industries is due in large part to an observed transfer of software activities linked with the consumer goods and intermediate goods industries towards the capital goods industries. This movement is the principal result of technical progress trends in the industrialized countries.

It is under the impulse of the widespread and generalized use of automation that innovation in the consumer goods and intermediate goods industries is also increasingly taken over by the capital goods industries. Thus, the capital goods sector is rapidly becoming the focal point of development of the all important service and design activities of the industrial sector of the economy.

Finally, certain major subsectors of the capital goods sector have the characteristic of being relatively inexpensive in terms of fixed capital investment per job created. From this point of view they do not have as heavy requirements as other industries, such as iron and steel.

Capital goods industries are generally skill and knowledge intensive, and since these attributes have a tendency to be person-embodied, many branches of capital goods industries are labour intensive, though there are significant variations among the subsectors. Metalworking machinery and agricultural machinery are among the most labour intensive of all industrial sectors.

The establishment and development of capital goods industries therefore contribute substantially to the fight against unemployment and under-employment in the developing countries both directly and indirectly through forward and backward linkages. However, because of its skill requirements, a high level of specific training activity is required to allow the benefits of the labour intensity of the industry to be realized.

To conclude this section, one may raise a rather awkward question: What would happen if an economy suddenly were cut off from its supply of (domestic and imported) capital goods? First, the capacity of such an economy to invest would be completely paralyzed. Second, its capacity to replace the worn out fixed capital assets would be reduced to nil with the resulting gradual

retrogression (and eventual disintegration) of the existing productive system. Third, after a complete depletion of existing capital goods stock, the output (and income) flow would be reduced to that available from immediate access to natural resources. However far fetched this picture may seem to be, it brings out very clearly the importance of capital goods for the development and reproduction of productive systems and for the raising of productivity levels and income generation capacity.

4. FACTORS AFFECTING THE DEMAND FOR CAPITAL GOODS WITH SPECIAL REFERENCE TO DEVELOPING COUNTRIES

A distinction must initially be made between effective demand and potential demand or market potential. The latter can be thought of as the total amount of capital goods that would be purchased (either from domestic or international sources) in a specified time period and under varying conditions. These conditions themselves might be controllable or uncontrollable. Effective demand for capital goods is then that portion of the potential that is realized on the market under a certain set of determining factors. Thus, demand is not a single number and its determination depends on the configuration of both controllable and uncontrollable factors.

The demand for capital goods is derived from the demand for those intermediate or final goods and services that require capital goods for their production. Apart from technology, which determines the production function (the relationship between output and input), the effective demand for these means of production depends on the level of the planned production of outputs and the prices of the inputs. This applies equally to a producer who aims at minimizing his cost for producing a given output or to one trying to maximize his output, given a fixed budget. In the case of a producer who is free to vary his levels of both output and cost, profit maximization requires that each input be utilized up to the point where its marginal product equals its price; in other words, the demand for inputs in this case depends, in addition to the factors mentioned above, also on the price of the produced output.[12/] Thus, we can easily envision that there are numerous variables that influence a producer's demand for capital goods.

The main factors can be grouped into economic, technological, governmental policy and demographic factors.

12/ These relationships can be easily proven mathematically by minimizing the producer's cost function or maximizing his output or profit functions, subject to the constraints of the production and cost functions.

The controllability or uncontrollability of these groups and their constituent subfactors will vary over time and place, but in any case a careful examination of them will go a long way in assisting us to understand why certain levels of demand are realized. Not only do these five groups of factors affect demand, they affect each other in a complicated series of interactions (for example the easily recognized triangular interactions between government policy, technological factors and economic factors).

4.1 Economic factors

Business cycle theories in developed market countries usually emphasize the role of capital investment (of which capital goods investment is a major component) as one of the main causes of economic activity up-turns and down-turns. The expectations of decision makers regarding the future play an important role in this respect. In developed market economies, cyclical down-turns reduce primary demand and therefore derived demand for capital goods. They also might encourage decision makers to defer investments in capital goods until any declines in the price of capital goods run their full course.

These effects, among others, make the capital goods industry a cyclical industry, growing faster than the economy as a whole in periods of growth and declining faster than the economy as a whole in periods of decline.

When applied to the developing countries this framework requires a number of modifications. In the developing countries when foreign exchange bottlenecks are not pressing, and national savings do not pose a major bottleneck, the general availability of funds ensures a high and sustained demand for investment in capital goods. Of course, in most developing countries, these conditions are not so evident. Given the important role of the public sector in the economies of many of these countries and specifically in the capital goods sector, economic cost-benefit analyses are frequently done with a generally longer time horizon than would be used in financial calculations. This should reduce the cyclical swing.

Another very important characteristic of demand for capital goods that must be taken into account here is the derived nature of this demand. This is an important source of demand instability. The demand for capital goods arises in an indirect way through the demand by the final consuming sectors. In other words, the derived demand for capital goods at a specific point in time reflects the perceived projected demand for consumer good in the present and future. The time horizon involved varies for different goods and depends on the time required to fill an order for that type of machine to provide the required function in the future. This adds an element of perception and further uncertainty to the derived demand for capital goods.

Equally important, the well-known accelerator principle works to amplify any swings in the demand for the final goods and services as they are transmitted, through the derived nature of the demand, to the capital goods sector. To illustrate, suppose an end user sector uses 100 machines to meet its normal demand and that it normally replaces 10 of its machines each year. Thus, the derived demand for capital goods is 10 machines per year. Now let the demand for the end users products increase by 10 per cent in a given year so that the end user now needs 10 new machines in addition to the 10 needed for replacement. Thus, the capital goods sector is suddenly faced with a demand that is 100 per cent higher than its normal demand; the demand has accelerated by 100 per cent through its derived nature. The accelerator principle works equally in the case of a down-turn in the primary demand.

Another element that leads to possible fluctuations in the demand for capital goods is their rather long lifespan. Because of this, available capital goods can be seen as embodying capital stock inventory. Industrial customers can be expected therefore to engage in the equivalent of inventory management of their capital stock in response to fluctuations in final demand. Thus, in periods of down-turn, not only is the demand for the flow of capital goods services reduced, there is also a reduction in inventory through depletion which further reduces the effective demand facing the capital goods industry. The opposite happens in periods of boom. Hence the fluctuation in demand for capital goods is more pronounced than the fluctuation in demand

for the goods and services they produce (the accelerator principle). The difficulties in projecting demand for capital goods that arise because of these fluctuations are augmented by the uncertainty concerning the underlying causes for a price change in the short run. For normal consumer goods a reduction in price can be expected to be followed by an outward movement along the demand schedule. For capital goods a reduction in price can be due to a downward shift in the demand schedule itself or an upward shift in the supply schedule due to technological factors, excess production capacity in capital goods plants, etc. Buyers will be cautious in making purchases until the situation has cleared up. The opposite is true of price increases. In the long run, however, the demand could be expected to behave normally with respect to price changes.

The impact of the price of a capital good on the decision to purchase it is strongly dependent on its share in total project costs and its importance to the overall process or project. If its cost is small compared to the overall costs of the project or production process and/or if the capital goods is essential to the project, then the price elasticity will be low. But if the capital good constitutes an important fraction of total cost, the demand for it could be price elastic. In other words, it can be expected that the propensity to buy a certain capital good that is an integral and necessary part of a large project and/or constitutes a small part in the cost structure will not vary with moderate changes in its price. The greater the importance of the capital good to the total cost structure of the overall project, the higher one can expect the effect of prices to be on the decision to buy or not to buy the capital good.

Figure 1 shows that for the developed countries the engineering industries (ISIC 38), which approximate the capital goods industries, are indeed the most active from a cyclical point of view, tending to grow faster in periods of economic boom and to decline more rapidly in periods of declining GDP. However, for developing countries the engineering industries are much less in step with the overall economic activity cycle as represented by the growth of GDP (figure 2).

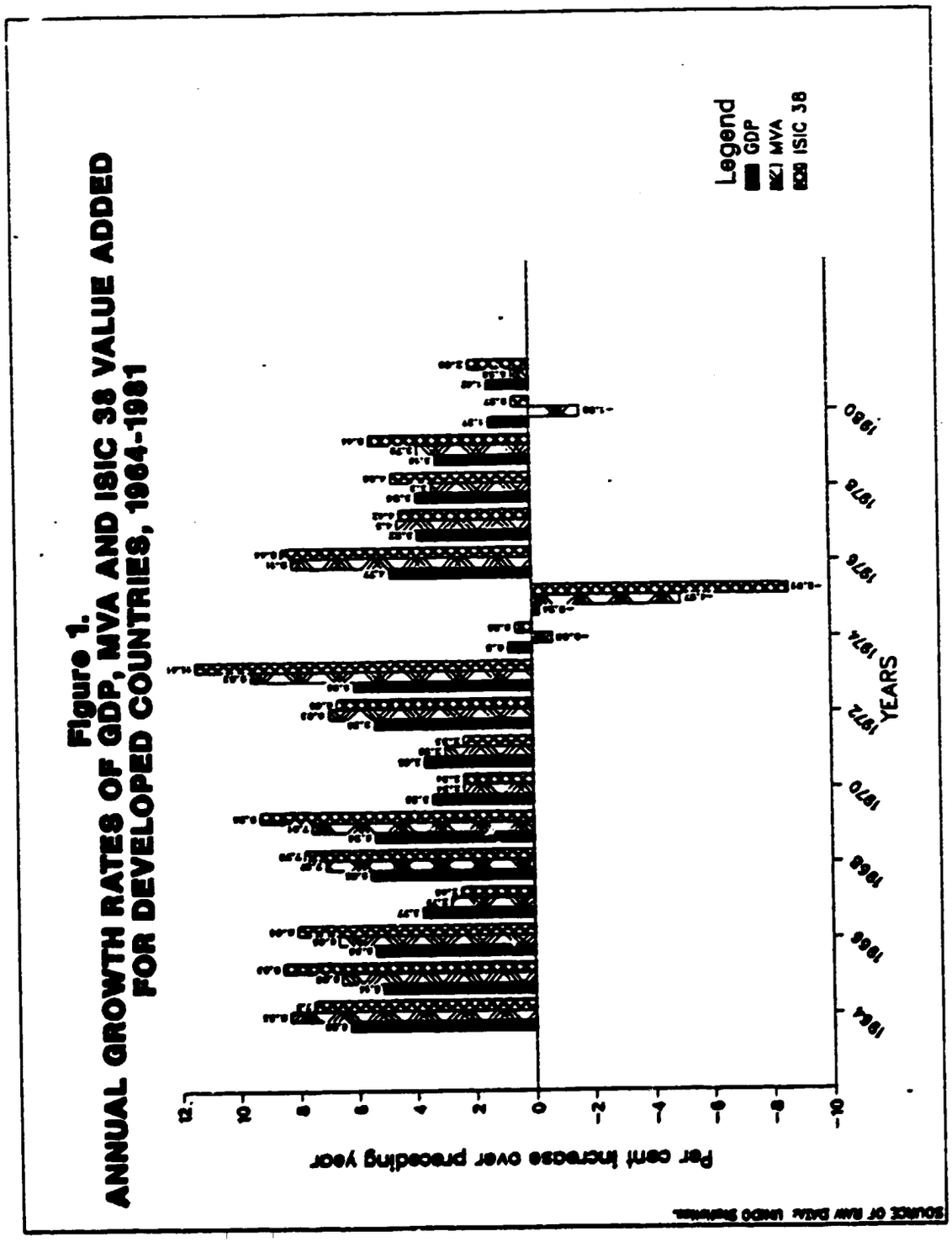
Figure 1.
ANNUAL GROWTH RATES OF GDP, MVA AND ISIC 38 VALUE ADDED
FOR DEVELOPED COUNTRIES, 1964-1981
Legend
GDP
MVA
ISIC 38
Per cent increase over preceding year
YEARS
1964
1966
1968
1970
1972
1974
1976
1978
1980

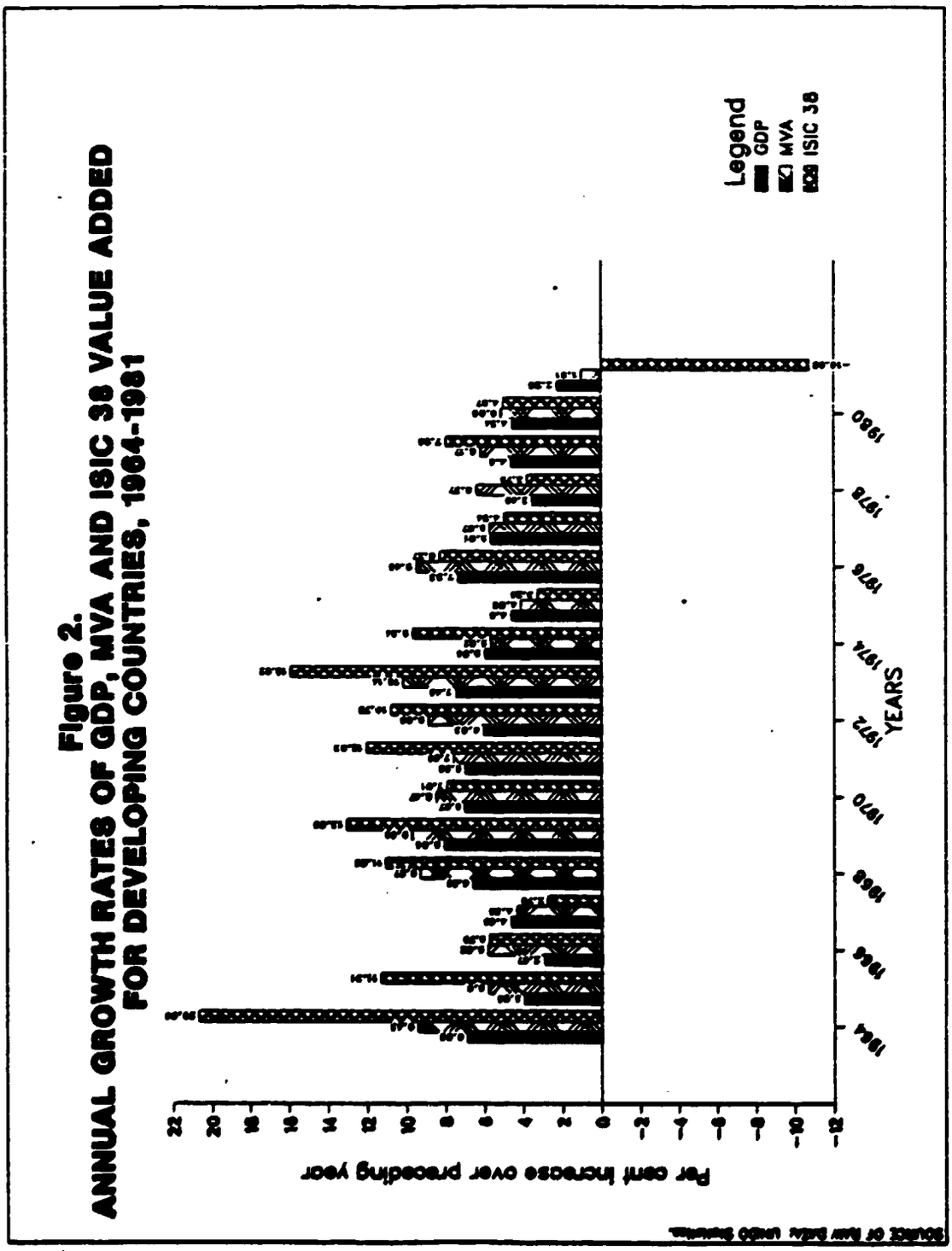
Figure 2.
ANNUAL GROWTH RATES OF GDP, MVA AND ISIC 38 VALUE ADDED
FOR DEVELOPING COUNTRIES, 1964-1981
Legend
GDP
MVA
ISIC 38
Per cent increase over preceding year
22
20
18
16
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
1964
1966
1968
1970
1972
1974
1976
1978
1980
YEARS

In the developing countries one would expect that in addition to lower cyclical forces there would be a lower price elasticity for capital goods than that observed in developed countries. Commitment to capital goods purchases in the South are made with a long time horizon, often in accordance with national plans, and with little attention to possible fractional fluctuation in prices.

It must also be noted here that maximum industrial output, and hence maximum derived demand for capital goods, will occur only when the optimal combination of production factors has been achieved. This optimal combination has to be continuously and dynamically maintained. It must be noted also that the optimal combination of production factors is affected partly by technological facilities and partly by economic features. Under varying technical conditions, each economic or production target may be reached by using different combinations of capital and labour. Whether any economy or region will employ either a labour-intensive technology or a capital-intensive one is decided by the relative evaluation of production factors, through a series of explicit and implicit criteria.

4.2 Technological factors

The set of technological factors determining demand for capital goods include: (1) the capital/output ratio, (2) depreciation and obsolescence rates, (3) technological base and infrastructure, and (4) end-user technology.

(1) Capital/output ratio. For the same desired final output, demand for capital goods varies with the ratio of the flow of capital goods services to the flow of output. Three factors can be expected to exert a major influence on the capital/output ratio. First, the number of processes available for the production tasks at hand. Although one can expect considerable possibilities for capital-labour substitution, especially in certain supporting tasks, few developing countries have exerted significant efforts to chose, for them an optimal mix of labour and capital. Therefore, for most of the developing countries, the ratio can be considered as given in the short and medium terms. Any concerted development in this area is usually undertaken in the developed countries. In fact, because of the relative abundancy of capital and

increasing labour costs in developed countries, it can be expected that the capital/output ratios will increase. This is indeed an observed trend and confirmed by a number of empirical studies.[13/] The second factor that affects the capital/output ratio in developing countries is the type of technology used. Although there have been some efforts to select optimal technologies, there is scope to do much more. The third factor is industrial efficiency and capacity utilization. In many developing countries, insufficient demand from domestic and external markets as well as adaptation of technology inappropriate for local conditions have been major factors contributing to low efficiency and low utilization rates. This causes derived demand for capital goods for a given level of demand for final goods to be higher than if adapted, appropriate technologies were used efficiently. This amounts to excessive demand for extra capital goods.

(2) Depreciation and obsolescence rates. Rapid depreciation of capital goods, increases replacement demand. How rapid it is depends, besides on the physical deterioration of the equipment itself, on the rate of technological obsolecence, the relative importance of the particular piece of equipment in the production process, cost factors, and such institutional factors as allowable depreciation rates for tax purposes. An example would be the petroleum industry in oil-rich developing countries where, because of the vital importance of the industry, any depreciated or obsolete equipment must be replaced rapidly. It must be noted also that one might expect the relative inadequacy of repair and maintenance in developing countries to increase depreciation rates in these countries.

(3) Technological base and infrastructure. Another broad technological factor that can hasten or impede the development of the demand for capital goods is the availability of a technological base (sufficient number of scientists, managers, engineers, technicians and R and D efforts) and infrastructure (electricity, roads and communications). These directly affect the general and technical capacity to absorb capital goods in an economy. That it will take considerable time in most developing countries before the

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13/ See Francis Stewart, op. cit.

infrastructure and technology base are sufficiently developed, is well known. In this respect, the level and rate of development differs for various developing countries even within the same region. If, for example, we examine one element of the technology base (i.e. the number of scientists and engineers per 100,000 of population) we find that for the Arab countries as a whole the number is around 800 (1976 figures), while in the ECWA region the number is only 523, reflecting the more developed base in the Arab countries of North Africa. These numbers compare unfavourably with the developed countries' numbers (2,875), but quite favourably with Africa (80) and Asia, excluding Japan (125). Even in the ECWA countries, there is a marked difference from a low of 19 in 1973 in Democratic Yemen to a high of 1,572 in 1974 in Qatar. As efforts to develop a technology base and infrastructure in developing countries begin to bear fruit as a whole, the increase in demand for capital goods can be expected to gain further momentum.

(4) End-user technology. The technology of the end-users of capital goods and their direction of technological development is an important determinant of demand for capital goods. With the growth of new modern end-user sectors in many developing countries (e.g. utilities, transportation, communication), it can be expected that there will be continued high demand for capital goods in these countries.

(5) New technological developments[14/] The production in the capital goods industry is influenced by the rapid diffusion of highly sophisticated technologies mainly based on microelectronics and informatics. These technologies not only tend to save labour, but also to provide other substantial benefits to innovating enterprises. If this diffusion goes faster in industrialized than in developing countries, then the existing technological gap will widen, in which case, the anticipated industrial share of developing countries in capital goods production is likely to be even smaller than current perspectives suggest. To illustrate this point further,

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14/ See, UNIDO, Informatics for Industrial Development, UNIDO/ID.326, February 1985.

one could look at the CAD (computer aided design) systems with regard to the differences between the industrialized and developing countries. According to an UNCTAD[15/] report, the developing countries have only about 0.5 per cent of the world's 6,000 CAD systems, and most of them are used for mapping and thus not in the engineering sector. In a recent UNIDO[16/] study three significant potential implications for developing countries were pointed out in this connection. First, although there are some signs of the use of CAD technologies in developing countries their diffusion is constrained by the absence of synergistic uses. Second, the global utilization of CAD technologies tends to concentrate precisely in those sectors where the developing countries made industrial progress in the 1970s. Accordingly, developing countries may face mounting competitive disadvantages which may threaten continued industrial growth. Third, the changing skill composition entailed in the introduction of CAD will present important advantages and disadvantages for developing countries.

4.3 Government policy

Government policy has direct effects on the demand for capital goods and, by more or less influencing all the other demand-determining factors, can also be expected to exert major indirect effects.

A complete discussion of the extremely important impact of governments on capital goods industries in developing countries is not possible here.[17/] Suffice it to say that governments affect the demand for capital goods, among

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15/ UNCTAD, The impact of electronics technology on the capital goods and industrial machinery sector: Implications for developing countries. TD/B/C.6/AC.7/3, Geneva, 1982, p. 39.

16/ UNIDO, Optimum scale production in developing countries: A preliminary review of prospects and potentialities in industrial sectors, UNIDO/IS.471, p. 8.

17/ For a further discussion of possible impacts of government policies see UNCTAD, "Technology issues in the capital goods sector: a case study of leading industrial machinery producers in Brazil", TD/B/C6.AC.7/6/1982.

others, through the following channels: overall economic policy, demand management and stabilization policy, procurement policy, planning efforts, promotion of technology base and infrastructure, legislation, taxation, international co-operation and transfer of technology policy, and import policy. The government's impact can obviously be both positive and negative. The point to be made is that analyzing and forecasting demand for capital goods requires thorough understanding and a grasp of the present and expected policies of the governments involved. In many developing countries the emergence of industry and thus derived demand for capital goods has been, generally speaking, the outgrowth of a broad import substitution policy, with tariffs as the main instrument of protectionism. However, these policies have not always been consistent or coherent in all the countries of the region, and have been to a large extent governed by tax revenue and other financial objectives of the governments involved. The policy of import substitution has often resulted in high tariffs for consumer goods and thus derived demand for capital goods. At the same time, the low protection offered to capital goods has caused much of this demand to be met through imported capital goods. An examination of other aspects of developing countries' industrialization policies, that monetary and credit policy has been used in varying degrees to promote industrialization. Taxation has often not had a major effect because of its tendency to have a low rate and to be inconsistently applied. Lack of continuity in industrial promotion measures has been an outstanding feature of many industrial promotion policies. Governments have provided varying levels of guidance, credit, direct investment and support of financial institutions. Technical advice, training and research is often markedly inadequate. The level of government intervention in developing countries has varied widely. Despite well-intended declarations, the regional outlook is lacking in developing countries' industrial policies. In short, there is a long way to go before a consistent, co-ordinated and integrated industrial strategy emerges in many of the developing countries. Until this is achieved, industrial activity and, as a result, demand for capital goods will be at a suboptimal level; a large part of whatever demand exists will be met through imports and not through increased local capital goods production.

4.4 Demographic factors

Finally, demographic factors affect demand for capital goods mainly through two mechanisms: first, increases in population can cut into per capita income and national savings which are necessary for investment and the realization of demand for capital goods. Second, population growth increases total derived demand for capital goods. However, the latter demand will depend upon the existing level of industrialization. Consequently, one should stress the linkage of GDP per capita and industrial production output to the demand for capital goods.

5. CAPITAL GOODS AND THE LIMA TARGET

The Lima Target stipulates that at least 25 per cent of the world manufacturing output should be produced in the developing countries by the year 2000. This Target was formulated in general terms and never meant a uniform 25 per cent share of world output for any given subsector of the manufacturing industry. However, it is pertinent to raise the question what should be the contribution of capital goods industry to the attainment of the overall Lima Target.

5.1 Achieving the Lima Target

It is quite obvious that to expand the developing countries' share in manufacturing output from about 10.4 per cent in 1981 to 25 per cent of the world output in 2000, will require a tremendous increase in the supply of capital goods to match the investment requirements. It has been estimated that the accomplishment of the Lima Target would involve an increase of the requirements of capital goods in developing countries by a factor of 13.4 or even 19.8 in 2000 compared to 1970 levels, depending on the assumptions made regarding the rate of growth of the GDP in the industrially developed countries (2.6 or 4 per cent per annum).[18/] Therefore, the extent to which the developing countries will be able to increase their indigenous capacity to supply the required capital goods and the extent to which they will continue to rely on imports from industrialized countries become of primary importance.

Even if the developing countries achieve the rates of overall industrial growth corresponding to the Lima objective, they cannot emerge from dependence without developing their own capital goods industry. In fact, it would accentuate dependence on the developed countries. Moreover, the possibility of achieving the Lima Target without developing the capital goods sector in the South is purely hypothetical. The finance and foreign exchange (balance of payments) constraints would present an insurmountable barrier.

18/ See "First global study on the capital goods industry: strategies for development", UNIDO, ID/WG.342/3.

5.2 Trade expansion and the growth of the capital goods sector

Certain considerations related to finance and foreign exchange (balance of payments) aspects and, in more general terms, to the present situation in the world economy indicate that an increase in indigenous supplies of capital goods is a necessary precondition for maintaining industrial development in the developing world. One should keep in mind that the increase in imports of capital goods by developing countries in the 1970s, which brought their share in total world imports of capital goods to about 30 per cent in 1982, was partly facilitated by an increase in the export earnings of Asia's newly industrializing countries[19/] and by a multifold increase in purchasing power of the oil-exporting developing countries. For the other developing countries, a major factor in expanding their import capacity was external borrowing. The prospects for the rest of the 1980s indicate that the two last mentioned factors are not likely to be at work, at least not in the same fashion and magnitude. This, of course, calls for more inward looking strategies in regard to the development of capital goods sector within the South.

During the 1970s the developing countries' net imports of capital goods increased substantially from about $US 60 billion in 1975 to $US 84 billion in 1981 in constant 1975 dollars. Capital goods imports represented more than one third of total imports of developing countries in the mid-1970s and their share rose to 40 per cent of total imports in 1982.[20/] The achievement of the Lima Target would entail another substantial increase in overall requirements for capital goods supplies. The question arises whether the developing countries would be able to increase their foreign exchange proceeds from exports of labour intensive manufactures (mainly consumer goods) and processed raw materials at a rate commensurate with increasing imports of capital goods so that the ratio of imported/locally supplied capital goods stays constant. Given the income elasticities for the basket of such export

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19/ See "Second world-wide study on the capital goods industry: the sector in figures" (UNIDO/IS.505), volume II, table A.01.ii.

20/ Ibid., tables i.01.a, i.02.a and i.03.a.

goods as well as a rising new protectionism in developed economies, the chances of achieving the required dynamism in exports of these types of goods are rather limited. Hence it appears necessary to increase the proportion of indigenous supply of capital goods.[21/] Another argument for fostering the capital goods industries in developing countries can be seen in the long run trend in relative prices of various types of commodities. Over the period 1955-1979, world export unit values of all groups of commodities, except fuels, showed a decline in relation to export unit values of engineering products (SITC section 7).

5.3 Intersectoral relations

When considering the intersectoral relations, one should take into account not only the direct effects (those generated by the sector itself) but also the indirect (secondary) effects that the capital goods industry induces through both backward and forward linkages to the other sectors of the economy. These indirect (secondary) effects depend, of course, on the degree of integration of the capital goods industry into the overall economic system. The reliance on local inputs generates linkages for suppliers of materials and components.

5.4 Some quantitative implications of the Lima Target

The quantitative implications of the Lima Target as well as the more precise nature of the above-mentioned economic linkages can be studied via the means of the global/regional simulation model system. One such system is the UNITAD Model, a joint UNIDO-UNCTAD project undertaken to explore the possible long term impacts of different development strategies on the world economy. The core of the model consists of a consistent set of eleven regional input/output type models, all interconnected through a trade module and a

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21/ This, of course, should not be interpreted as an unqualified call for import substitution at the national level. The possibilities for the production of all types of capital goods are rather limited, especially in the case of small and medium size developing countries. Therefore, indigenous supply means production within the developing world as a whole and requires concurrently development of new forms of South-South co-operation.

financial flow module.[22/] Although future states of the world economy are generated through the model system, they are not strictly speaking forecasts but rather simulations conditioned on certain assumptions concerning structural and exogeneous variables. The so-called reference (or trend) scenario is an extrapolation of the historical growth patterns prior to the 1980-1983 global recession and adjusted for the most probable deviations away from the trends of the 1970s.[23/]

In addition, two scenarios related to the International Development Strategy (IDS) have been simulated[24/] and part of the results of interest here are summarized below. The two scenarios are designated IDS1 and IDS2, respectively. They are based on a set of common assumptions regarding overall economic growth in the developed and the developing countries and regarding financial flows. Differing assumptions were made regarding trade policies and agricultural policies. Essentially, IDS1 simulates conditions more favourable to the success of the IDS than scenario IDS2 in that the former, as well as the reference scenario, assumes a beginning of South-South economic co-operation as well as a vigorous development of the agricultural sector (in contrast with the reference scenario), whereas conservative assumptions on these issues are made in IDS2.

Among the interesting results of the simulations is the 4.9 per cent growth rate for the capital goods sector in the developing countries found in IDS1 versus 4.2 per cent in IDS2 (the trend scenario yields a growth rate of 4.5 per cent in capital goods). The higher growth rate for IDS1 is a direct result of the assumption of a relatively high proportion of intraregional

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22/ For a more detailed description, see 1980 Report on the UNITAD System (UNIDO/IS.224), April 1981.

23/ The resulting growth rates for the regional economies by major economic sector are used as a standard in all studies issued in the Sectoral Studies Series.

24/ See The UNITAD System. 1981 Report (UNIDO/IS.337), September 1982.

trade in equipment among developing countries in IDS1. As far as embodied technology is concerned, this growth of the capital goods sector can be clearly interpreted in terms of a reduction in technological dependence.25/

Despite the highly differing assumptions among the three scenarios, the relative importance of the basic product sector remains very similar in each scenario. Also, the light industry sector shows a relative decline in both of the high growth scenarios, IDS1 and IDS2, as compared to the trend scenario. Thus, the principal beneficiaries of a high growth process would be the primary processing and the capital goods activities. This results from the mutually supporting function of these two sectors, noted earlier: the basic processing sector is very capital intensive and its growth provides a market for the capital goods sector which in turn consumes much of the output of the primary products sector.26/

From a regional point of view, a comparison of the simulation results indicates that fragmented, domestic markets perpetuate or increase the dependence of the South on the North, whereas co-operation at the regional level among the developing countries in the capital goods sector decreases the overall dependence in manufactures. Correspondingly, a reliance on the world markets can be very beneficial during prosperous times but increases the vulnerability to downswings in the global economy. However, for most developing countries, the demand for imported manufactures is so high in the course of the industrialization process that their exports simply cannot keep pace with the imports in a South-North oriented trade strategy, especially with a sluggish economy in the developed world, in spite of generous assumptions regarding the penetration of developing country exports into developed country markets. Thus, the scenarios clearly illustrate the potential benefits that can be derived from regional co-operation in the capital goods sector.

25/ Op. cit., p. 75.

26/ Ibid., p. 78.

6. STRUCTURE AND POSITION OF THE CAPITAL GOODS INDUSTRY

6.1 Position of the capital goods industry in manufacturing

6.1.1 The capital goods industry in total world manufacturing

At the global level, the capital goods industry represents the most important part of the manufacturing sector in both qualitative and quantitative terms. The share of capital goods industry (approximated here by ISIC major group 38 i.e. manufacture of fabricated metal products, machinery and equipment) in value added of the total world manufacturing sector has been steadily increasing, amounting to nearly 40 per cent by 1981. Its share in total world manufacturing employment was slightly less than one third (about 32.5 per cent) in 1979. Thus the capital goods industry is by far the largest among manufacturing industries, followed by ISIC major group 35 (chemical, petroleum, plastic products) whose share amounted to about 15 per cent in total world manufacturing value added in 1981.[27/]

The world manufacturing value added (MVA) in the capital goods sector increased from $US 298.7 billion in 1964 to $US 759.9 billion in 1981 (at 1975 prices). During the period from 1964 to 1970, a period of rapid industrial growth throughout the world, the capital goods sector grew at a fairly constant annual rate of 7.2 per cent in terms of real MVA. But since then up to 1981, the growth has slowed down and became more erratic from one year to the next, averaging some 4.8 per cent per year.

The capital goods industry has also consistently shown an above average dynamism. Over the period 1964-1981, the capital goods industry recorded an annual growth rate of 5.6 per cent compared to a 4.6 per cent[28/] growth rate

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27/ A statistical review of the world industrial situation 1984 (UNIDO/IS.506).

28/ All shares calculated on the basis of data contained in UN Yearbook of Industrial Statistics, 1980 edition, Vol. I, U.N. 1982.

for world manufacturing as a whole. These differentials in growth rates resulted in an increasing share of the capital goods industry in total manufacturing value added from 35 per cent in 1968 to 37.6 per cent in 1975 up to the above mentioned level of 40 per cent in 1981. This is a reflection of the central role that the capital goods industry has performed in the world-wide process of industrial development. The expansion of machinery and equipment output provided the basis for investment, modernization, increased productivity and output in other industrial sectors as well as in agriculture and services.

6.1.2 Employment in the capital goods industry

With regard to employment, the position of the capital goods industry within the manufacturing sector is characterized by rather peculiar features in the developing countries as compared to the other two economic groupings. While in both the centrally planned and the developed market economies the share of the capital goods industry in manufacturing output was rougly the same as the share in 1980, in the developing countries there was a wide gap between these two shares: in 1980, the capital goods industry accounted for 23.4 per cent of MVA but only for 14 per cent of manufacturing employment. This suggests a wide difference in productivity between the capital goods industry and the rest of the manufacturing sector, in particular textiles, clothing, food and other traditional industries in developing countries.

Employment in the capital goods industry grew at relatively high rates of 5.9 per cent per annum in 1963-1973 and at 4.1 per cent in 1973-1980. However, since the total manufacturing employment expanded at a rate of 4.2 per cent in both periods, the share of the capital goods industry in total employment increased only moderately from 11.6 per cent in 1963 to 14.3 per cent in 1973 and then slightly declined to 14 per cent in 1980. In this respect there have not been any significant break-throughs in changing the employment structure in the developing countries and in bringing the role of the capital goods industry closer to the role that it plays in employment structures of industrially developed countries. On the contrary, the gap has widened. In this connection it should be pointed out that during the period 1973-1980 a very adverse development took place in the developing countries

regarding the growth rate of productivity in manufacturing which declined to 0.7 per cent from a 3.8 per cent annual growth rate in 1963-1973. This held also for the capital goods industry, where the productivity growth rate slowed down from 4.4 to 2.4 per cent. However, there were other industries which recorded even negative growth rates in productivity in 1973-1980 such as e.g. food, beverages and tobacco (-0.9 per cent), wearing apparel, leather and footwear (-2.6 per cent), textile (-0.1 per cent) and others. At the same time, employment in the first two mentioned industries expanded at a very high rate of 5.7 per cent. As a result the share of these two industries in total manufacturing employment came to 36.6 per cent in 1979. This kind of a structural shift towards industries with declining productivity has a very negative impact on the overall productivity in the manufacturing sector.

6.2 Current situation, trends and output composition of capital goods industry by product group and country groupings

6.2.1 Current situation and trends

In order to assess the current situation and trends in the global distribution of the capital goods industry, it might be useful to give at the outset a brief review of the developments with regard to the manufacturing as a whole. After all, capital goods industries are interrelated with the other sectors of the economy, in particular with the rest of the manufacturing sector. Thus overall levels and dynamics of manufacturing activities provide a broader framework within which the developments in the capital goods industry take place.

Reviewing the long-term trends of changes in the distribution of world manufacturing ouput two periods can be distinguished. The 1960s witnessed a rapid industrial growth throughout the world. The centrally planned economies which increased their share from about 14 per cent of world manufacturing value added (MVA) in 1960 to 19 per cent in 1973 and 24.2 per cent in 1981, whereas the share of developed market economies went from about 78 per cent in 1960 to about 65.2 per cent in 1973 and 65.2 per cent in 1981. The developing

countries' share remained essentially unchanged (within the range of 8.2 to 8.8 per cent in the 1970s and increased to 10.6 per cent in 1981 of the world MVA).29/

The 1970s were characterized by more profound changes in the configuration of the world manufacturing output. The developed market economies, after a slowdown in 1970-1971, experienced a short-lived boom in 1972-1973 which turned into the recession of 1974-1975. After the 1976-1979 recovery another recession set in starting in 1980. At the beginning of 1983 signs of another recovery begun to appear. This slow and erratic pace of manufacturing growth during the 1970s resulted in the decline of developed market economies' share in world MVA from 73.4 per cent in 1970 to 65.2 per cent in 1980.

The developing countries have been exposed, to varying degrees, to the unfavourable external environment caused by the recent world economic recession. Slackening demand for their traditional export commodities, concomitant worsening of terms of trade, the rising tide of new protectionism, increasing costs of external borrowing, especially towards the end of the 1970s, all exerted a dampening effect on the industrial growth in the developing countries. In spite of this, the developing countries on the whole succeeded in sustaining a reasonable momentum of industrial growth.30/ Their share in world MVA increased from 8.8 per cent in 1970 to 11 per cent in 1981. But the preliminary data and estimates for 1981-1982 suggest that the recent crises in the industrialized economies and the related effects exerted through international trade and financial mechanisms on manufacturing growth in developing countries have arrested, for the time being, further increases in their share of world MVA. Looking at the gains of developing countries

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29/ UNIDO, Handbook of Industrial Statistics 1984, New York, 1985.

30/ Admittedly this was achieved in a number of countries at the cost of a considerable increase in external debt.

over the period 1970-1982 from the perspective of achieving the Lima target of 25 per cent of world MVA in the year 2000, they seem to be very modest, indeed.[31/]

Table 1 shows the regional distribution of the capital goods sector in terms of value added.[32/] Clearly, the European CPEs have greatly increased their share in the global production of capital goods, primarily at the expense of the developed market economies. Although the absolute volume of production has increased manifold, the developing countries' share in the global production has not improved a great deal. Their capital goods industry developed at a high rate in the first half of the 1970s (about 11.6 per cent per annum) whereas in the second half of the 1970s the growth slackened to 6.3 per cent. Thus the gains of developing countries in world capital goods production were concentrated within the period of 1970-1975 when their share increased from 4.3 per cent to 5.8 per cent. During the second half of the decade there was no improvement in the relative position of developing countries, their share in the world value added (ISIC 38) in 1981 being estimated at 5.1 per cent.

Among the three developing regions, Asia showed the highest dynamism up to 1980, thereafter the pace apparently slackened. In view of the high concentration of production of capital goods among a few major producers, the individual countries' performance strongly influences the regional figures. Thus e.g. the recession which took place in the capital goods industry in the Republic of Korea in 1980 had a considerable impact on the performance of the Asian region. The same applies to Latin America where Brazil, and to a lesser extent Mexico, essentially determine the overall regional growth rates. On the whole, Latin America's share in world capital goods production increased from 2.9 per cent in 1967 to 4 per cent in 1975 but decreased to

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31/ All the data in this section on world MVA exclude P.R. China. Recently, UNIDO made an attempt to estimate the share of P.R. China in world MVA. Preliminary results of this exercise indicate that the share of P.R. China in world MVA amounted to about 3.8 per cent in 1980. For details and the methodology used, see Industrial Development Survey, UNIDO, ID/304, 1983.

32/ For figures on gross output (production) see Second world-wide study of capital goods: the sector in figures, Sectoral Studies Series No. 15, Vol.II, UNIDO/IS.505, December 1984, section A.

Table 1. Manufactured value added in the capital goods sector (ISIC 38) and share by UNITAD regions, 1964 to 1981 ($US million, constant 1975 prices and percentage shares)

Region	1964	1967	1970	1975	1981
North America	96,197 (32.2)	126,443 (34.5)	127,553 (28.1)	144,601 (25.3)	190,364 (25.1)
Western Europe (North)	113,063 (37.9)	120,055 (32.8)	154,108 (33.9)	167,230 (29.2)	186,702 (24.6)
Western Europe (South)	5,040 (1.7)	6,272 (1.7)	9,681 (2.1)	14,355 (2.5)	17,422 (2.3)
CPE Europe	48,804 (16.3)	65,889 (18.0)	90,106 (19.8)	154,716 (27.0)	227,659 (30.0)
Japan	16,805 (5.6)	25,630 (7.0)	44,838 (9.9)	49,793 (8.7)	90,030 (11.8)
Other developed	6,439 (2.2)	7,022 (1.9)	7,913 (1.7)	8,459 (1.5)	8,610 (1.1)
Latin America and the Caribbean	8,444 (2.8)	10,591 (2.9)	14,468 (3.2)	23,116 (4.0)	25,069 (3.3)
Tropical Africa	249 (0.1)	353 (0.1)	496 (0.1)	753 (0.1)	1,068 (0.1)
North Africa	311 (0.1)	317 (0.1)	486 (0.1)	718 (0.1)	479 (0.1)
West Asia	473 (0.2)	588 (0.2)	824 (0.2)	2,272 (0.4)	2,587 (0.3)
Indian Subcontinent	1,955 (0.7)	2,068 (0.6)	2,576 (0.6)	3,050 (0.5)	3,764 (0.5)
South-East Asia	144 (0.0)	163 (0.0)	233 (0.1)	458 (0.1)	926 (0.1)
East Asia	786 (0.3)	901 (0.2)	1,239 (0.3)	2,713 (0.5)	5,202 (0.7)
CPE Asia 1/	... -	3 -	6 -	10 -	18 -
	298,710 (100)	366,296 (100)	454,527 (100)	572,244 (100)	759,900 (100)

1/ Excluding People's Republic of China.

Source: UNIDO data base.

3.3 per cent in 1981, that of Asia from 1 per cent in 1967 to 1.6 per cent in 1981. Africa, despite some progress, remains the region with the least developed capital industry amounting to about 0.2 per cent of the world total in 1981.

6.2.2 Output composition

Table 2 shows that there has not been a radical change in the output composition in this sector between 1964 and 1981. Thus, for example, the manufacture of machinery (except electrical) has kept its share of around 28 per cent, and the manufacture of transport equipment its share of around 26 per cent. A trend to declining shares is shown in the manufacture of fabricated metal products (except machinery and equipment) from 20 per cent in 1964 to 16 per cent in 1981. On the other hand the share of manufacture of electrical machinery and the like increased from 18 per cent in 1964 to 24 per cent in 1981. In the case of the manufacture of precision and scientific equipment a similar situation is observed and the share increased from 6.5 per cent in 1964 to 9.2 per cent in 1981.

An analysis of the yearly growth rates by product group confirms that the sectors which are increasing their share are those with the higher growth rates (table 3). The manufacture of electrical machinery and equipment, although having a decreasing growth rate, still maintains a higher performance when compared with the manufacture of metal products or transport equipment. The situation is rather different in the manufacture of professional scientific and precision equipment with the highest growth rates of all the branches of the capital goods sector.

The analysis leads to the conclusion regarding new technology developments and new products that with an electronic or microelectronic component these will increase their dynamic impact on the entire sector. This fact is also evident from an analysis of trade developments as it will be seen in further chapters.

Table 2. Distribution of the global manufacturing value added of capital goods and share by product group, 1964 to 1981 ($US million, constant 1975 prices and percentage shares)

		1964	1967	1970	1975	1981
381	Manufacture of fabricated metal products, except machinery and equipment	60,504 (20.3)	70,426 (19.2)	87,013 (19.1)	103,207 (18.0)	124,928 (16.4)
382	Manufacture of machinery, except electrical	83,726 (28.0)	102,135 (27.9)	126,506 (27.8)	157,197 (27.5)	206,535 (27.2)
383	Manufacture of electrical machinery apparatus, appliances and supplies	54,779 (18.3)	71,373 (19.5)	94,385 (20.8)	121,665 (21.3)	180,756 (23.8)
384	Manufacture of transport equipment	80,307 (26.9)	97,016 (26.5)	114,092 (25.1)	143,836 (25.1)	177,958 (23.4)
385	Manufacture of professional and scientific equipment, n.e.s.	19,391 (6.5)	25,345 (6.9)	32,527 (7.2)	46,236 (8.1)	69,723 (9.2)
		298,710 (100)	366,296 (100)	454,527 (100)	572,244 (100)	759,900 (100)

Source: UNIDO data base.

Table 3. Annual real value added growth rates in capital goods by product group, 1964 to 1981 (per cent)

		1964-1970	1970-1975	1975-1981
381	Manufacture of fabricated metal products (except machinery)	6.2	3.5	3.2
382	Machinery (except electrical)	7.1	4.4	4.7
383	Electrical machinery	9.5	5.2	6.8
384	Transport equipment	6.0	4.7	3.6
385	Manufacture of professional and scientific equipment	9.0	7.3	7.1
	Total	7.2	4.7	4.8

Source: UNIDO data base.

None of the above-mentioned figures include the Peop.e's Republic of China. Recent estimates made by the UNIDO secretariat put the value of production in capital goods industry of the Asian CPEs which are dominated by the People's Republic of China at $US 52 billion in 1975 and $US 56 billion in 1980.[33/] The corresponding figures for value added would be from 25 to 30 per cent of those for gross output (production).[34/] The share of Asian CPE in total world production of capital goods (ISIC 38) amounts to 7.6 per cent in 1975 and 2.9 per cent in 1980.[35/]

33/ Second world-wide study of capital goods: the sector in figures (UNIDO/IS.505), Sectoral Studies Series No. 15, Vol.II, December 1984, table A.01. See also UNCTAD, The Capital Goods and Industrial Machinery Sector in Developing Countries: Issues in the Transfer and Development of Technology, ID/B/C.6/AC.7/2, 1982 and Potentialities and Possible Progress of the Capital Goods Industry Development in the Developing Countries including Small and Medium-Size Developing Countries, UNIDO, ID/WG.342/1, 1981.

34/ Second world-wide study of capital goods: the sector in figures (UNIDO/IS.505), Sectoral Studies Series No. 15, Vol.II, December 1984, table C.01.

35/ Op. cit., table A.01.ii.

6.3 Structural changes in the capital goods industry and its position in manufacturing

In this section the changes in the structure and position of the capital goods industry within the manufacturing sector of the three country groupings are reviewed. The available data make it possible to review the changes over the 1963-1980 period which is broken down into two subperiods: 1963-1973 which was marked by generally high rates of growth and 1973-1979 during which a slowdown in industrial growth occurred, although to a widely varying degree, in all economic groupings. The data on which the review is based are contained in the latest issue of UNIDO Statistical Review of the World Industrial Situation, 1983.

6.3.1 In developed market economies

The capital goods industry (defined as ISIC 38) is by far the largest major industrial group and showed a consistent trend in increasing its share in MVA from 36.3 per cent in 1963 to 39.2 per cent in 1973 and to 40.5 per cent in 1980 (table 4). The only other major group which gained in importance was ISIC 35 (chemical, petroleum, plastic products), its share in MVA increased from 10.9 per cent in 1963 to 14.5 per cent in 1973 and 15.3 per cent in 1980. The shares of all other major industrial groups tended to decline, with structural shifts being concentrated to the 1963-1973 period. In the following period, the pace of structural change slackened, although there are exceptions to this such as the basic metals industry where the absolute decline in iron and steel output brought about a much more significant drop in its share in MVA than in the previous period.

In regard to the structural changes within the capital goods industry, electrical machinery (ISIC 383) was by far the most dynamic subsector in 1963-1973 period with a 8.3 per cent real growth rate followed by ISIC 385 (professional and scientific equipment, photographic and optical goods)

growing at 6.3 per cent per annum.[36/] In the following period of a general slowdown these two industries maintained the above average momentum, however, their ranking changed with ISIC 385 growing at 4.9 per cent and ISIC 383 at 3.6 per cent per annum. The changes in the structure of the capital goods industry are summarized below.

Table 4. Developed market economies - shares of capital goods industry and of its product group in total manufacturing value added (1975 prices)

ISIC		1963	1973	1980
38	Total capital goods	36.3 (100)	39.2	40.5 (100)
381	Manufacture of fabricated metal products (except machinery)	7.2 (19.8)	7.3	6.9 (17.0)
382	Machinery (except electrical)	10.4 (28.6)	11.0	11.4 (28.1)
383	Electrical machinery	6.7 (18.4)	8.7	9.9 (24.4)
384	Transport equipment	10.3 (28.4)	10.3	9.9 (24.4)
385	Manufacture of professional and scientific equipment	1.7 (4.8)	1.9	2.4 (6.1)

Note: Figures in parenthesis indicate the share of individual industries in value added of ISIC 38 in 1963 and 1970.

Source: UNIDO, A Statistical Review of the World Industrial Situation 1983.

A major structural change over the 1963-1980 period can be seen in the increasing importance of electrical machinery (ISIC 383), although non-electric machinery (ISIC 382) is still maintaining its position as the largest subsector of the capital goods industry. Both transport equipment (ISIC 384) and fabricated metal products (ISIC 381) shares in capital goods industry show a declining trend. Professional and scientific equipment (ISIC 385), although growing relatively fast, remains the smallest subsector within the capital goods industry.

36/ For corresponding growth rates in gross output (production), which differ from those in terms of value added, see Second world-wide study of capital goods: the sector in figures (UNIDO/IS.505), Sectoral Studies Series No. 15, Vol.II, December 1984, section A.

In regard to employment, the capital goods industry in developed market economies is by far the largest employer among the major industrial groups; its share in total manufacturing employment increased from 35.2 per cent in 1963 to 38.6 per cent in 1973 and to 40.1 per cent in 1979. It should be pointed out that this took place under conditions of relatively slow growth in manufacturing employment in the period 1963-1973 (1.2 per cent per annum) and a deteriorating situation in the 1973-1980 period when the employment in manufacturing declined by 0.5 per cent per annum. Thus the increasing share of the capital goods industry in manufacturing employment in the 1970s is not a reflection of the expansion of employment in this industry (it increased only marginally by 0.1 per cent annually in 1973-1980) but rather of the decline in employment in the rest of the manufacturing sector.

6.3.2 In the centrally planned economies

The capital goods industry was the most dynamic part of the manufacturing sector in both observed periods. During 1963-1973, it grew at a rate of 11.2 per cent per annum compared to a 8.9 per cent growth rate for the total manufacturing. In 1973-1980, the respective growth rates were 9.6 and 7 per cent.[37/] The other major industrial group which recorded above average growth rates, was the chemical industry (ISIC 35) which grew at a rate of 10.5 per cent in 1963-1973 and 7.5 per cent in 1973-1979. The pace of growth in other industrial groups was below average for total manufacturing in both periods, with the lowest growth rate recorded in ISIC 31 (food, beverages and tobacco): 5.7 per cent and 3.6 per cent in the two periods. The priority accorded to the capital goods industry led to a major structural transformation of the manufacturing sector. The share of capital goods in manufacturing output increased from 30.5 per cent in 1963 to 37.7 per cent in 1973 and to 44.3 per cent in 1980, the capital goods industry clearly serving as the engine of industrial growth.

37/ Op. cit.

Due to a lack of data on value added (according to ISIC classification) it is not possible to provide here an entirely comparable structural breakdown of the capital goods industry in centrally planned economies by industrial branches. However, in terms of total estimated value of production (gross output), the various branches have from 1975 to 1980 pretty much retained their relative shares in total capital goods.[38/] The entire sector grew over this period at an annual growth rate of 7.4 per cent; only the metal products branch (ISIC 381) grew at a significant slower rate, 5.5 per cent, while electrical machinery had the fastest annual growth rate, namely 8.2 per cent. Over the period 1980-1985, the annual growth rates in the various branches are expected to become more uniform, between 5.5 and 6.1 per cent. With regard to employment, the structural changes within the manufacturing sector have been much less intense than those observed in the structure of output. Concerning the capital goods industry, though its share in manufacturing employment increased from 39.8 per cent in 1963 to 42.9 per cent in 1973 and to 44 per cent in 1980, this was a much less significant change than that in the share in output. The major contribution to the increased share of capital goods industry in manufacturing output thus came from the increase in productivity which was rising at a high rate of 7.3 per cent per annum (1963-1973) and at 7 per cent (1973-1980).

6.3.3 In the developing countries

The position of the capital goods industry in the manufacturing sector is vastly different from the situation found in both developed market and the centrally planned economies. It should be mentioned that the developing countries represent a much more heterogeneous group than is the case of both the other major economic groupings.[39/] The spectrum of the developing

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38/ Op. cit.

39/ E.g. among the centrally planned economies a definite trend towards similarity in the positon of the capital goods industry can be observed. Whereas in 1965 the share of the capital goods industry in total gross manufacturing output ranged from 20.6 to 38.1 per cent in individual countries, this range narrowed down to 36.2 - 45.9 per cent in 1979. In six of the seven countries of this group the share of the capital goods industry in gross manufacturing output exceeded 40 per cent in 1979 (See ID/WG.357/5).

countries ranges from countries where the capital goods industry has reached a relatively advanced stage (e.g. Brazil, Republic of Korea, India etc.) to a great number of countries where the capital goods industry is practically non-existent.

Therefore, the generalizations about the position of the capital goods industry in industrial structure are of a more limited applicability. Nevertheless, even at this very aggregate level the comparison between the developing countries and the other two major economic groupings provides a broad indication of the relative underdevelopment and backwardness of the capital goods industry in the developing countries.

In contrast to the rest of the world, the capital goods industry in the developing countries, is not a dominant part of the manufacturing sector. In 1963, the share of the capital goods industry in total MVA amounted only to 15.6 per cent. The manufacturing sector consisted largely of food and other industries within ISIC group 31 with 24.2 per cent of MVA, of chemical, petroleum and plastic products (ISIC 35) with 20.6 per cent[40/] of MVA and of textile and other industries within ISIC 32 with 18.9 per cent of MVA.

The period 1963-1973 was marked by substantial shifts in manufacturing structure in the developing world. The capital goods industry developed at the highest pace (10.6 per cent per annum) of all the major industrial groups, followed closely by the chemical industries group (ISIC 35) at a rate of 10.1 per cent. The capital goods industry thus exceeded the growth rate for the manufacturing sector (7.1 per cent) by a margin of 3.5 percentage points. As a result, the share of capital goods industry in MVA increased to 22 per cent in 1973, surpassing that of ISIC 31 (18.8 per cent), ISIC 32 (14 per cent), but still ranking only second to the ISIC 35 (24 per cent).

In the period of 1973-1980 when the rate of manufacturing growth showed 5.3 per cent, the pace of structural changes within the manufacturing sector considerably slackened. The capital goods industry growth rate declined to

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40/ Here major role was played by petroleum refineries which accounted for 10.7 per cent of total MVA.

7 per cent, thus exceeding the manufacturing growth rate by a margin of only 1.7 percentage points. This led to a further, though much less significant increase in the share of capital goods industry in MVA to 23 per cent in 1980. This slowdown in the process of strenghtening the structural position of the capital goods industry in developing countries is disturbing. Largely due to a very low rate of growth (3.0 per cent in petroleum refineries output) the share of the ISIC 38 group of industries marginally declined to 23.2 per cent of MVA in 1979. The capital goods industry thus became by 1980 the largest major industrial group within the manufacturing sector. However, there remains a huge gap between the position of this industry in total manufacturing in developing countries and that in the developed market economies and the centrally planned economies.

Within the capital goods industry, during the 1963-1973 period, non-electrical machinery (ISIC 382) was the most dynamic subsector followed by electrical machinery (ISIC 383) and transport equipment (ISIC 384). In the following period while the growth rates for both ISIC 382 and 384 were considerably reduced, electrical machinery continued to expand at a high rate. The changes in the structure of capital goods industry are summarized in table 5.

Table 5. Developing countries - shares of the capital goods industry and of its product group in total manufacturing value added (1975 prices)

ISIC		1963	1973	1980
38	Total Capital Goods	15.6 (100.0)	21.8 (100.0)	23.4 (100.0)
381	Manufacture of fabricated metal products (except machinery)	4.0 (25.6)	4.6 (21.1)	4.7 (20.1)
382	Machinery (except electrical)	2.7 (17.3)	5.0 (22.9)	5.3 (22.6)
383	Electrical machinery	3.1 (19.9)	4.4 (20.2)	5.5 (23.5)
384	Transport equipment	5.4 (34.6)	7.4 (33.9)	7.5 (32.1)
385	Manufacture of professional and scientific equipment	0.4 (2.6)	0.4 (1.9)	0.4 (1.7)

Note: Figures in parenthesis indicate the share of industrial branches in total value added in ISIC 38.

Source: UNIDO, A Statistical Review of the World Industrial Situation 1983.

The structural changes within the capital goods industry thus appear to be concentrated in the declining importance of fabricated metal products (ISIC 381) in particular in 1963-1973 period. Later its share stabilized. The major gain was achieved by electrical machinery (ISIC 383) followed by non-electrical machinery (ISIC 382) although in the latter case the gain was limited to the 1963-1973 period and then reversed into a moderate decline. Transport equipment (ISIC 384), in spite of a declining share, remained the largest subsector of capital goods industry mainly due to the size of this industry in Latin America.

7. OVERVIEW OF WORLD TRADE IN CAPITAL GOODS

In 1981 the value of world exports of capital goods was $ 334.0 billions at 1975 constant prices. A composition of the exports according to the industrial classification is presented in table 6.[41/]

Table 6. World exports of capital goods and share by product group, 1964-1981 ($US million, constant 1975 prices and percentage shares)

		1964	1967	1970	1975	1981
381	Fabricated metal products, except machinery and equipment	5,641 (8.6)	7,255 (8.1)	10,382 (7.4)	18,138 (7.7)	25,492 (7.6)
382	Machinery, except electrical machinery	26,708 (40.5)	34,487 (38.4)	49,151 (35.3)	82,693 (34.9)	108,629 (32.5)
383	Electrical machinery, apparatus, appliances and supplies	7,273 (11.0)	10,267 (11.4)	17,238 (12.4)	35,600 (15.0)	63,959 (19.2)
384	Transport equipment	24,167 (36.7)	34,721 (38.7)	58,155 (41.7)	93,250 (39.3)	122,878 (36.8)
385	Professional and scientific equipment	2,111 (3.2)	3,064 (3.4)	4,478 (3.2)	7,396 (3.1)	13,084 (3.9)
		65,900 (100.0)	89,794 (100.0)	139,404 (100.0)	237,077 (100.0)	334,043 (100.0)

Source: UNIDO data base.

The main category of capital goods traded internationally is transport equipment, followed by machinery (not including electrical machinery). In both cases their shares have decreased since 1970. An increase can be observed in the exports of electrical machinery (ISIC 383), following the pattern already observed in the production of this branch.

41/ UNIDO/IS.505, op. cit. gives 1975, 1980 and 1985 (estimates) data.

The most rapid growth in the value of exports occurred in the developing market economies. But, it was limited to two regions, namely Latin America and the new manufacturing countries in East Asia. The largest imports were registered by the developed market economies; in 1981 around $ 312,4 billions at 1975 constant prices. With a growth rate of nearly 8 per cent yearly, the fastest growth of imports in capital goods over the period 1975-1980 occurred in the developed market economies. The growth rate for the developing market economies was 6.4 per cent while imports to the European CPE's contracted sharply at the rate of -3.9 per year; the Asian CPE's imports, however, grew at 8.4 per cent annually.

Most of the trade of the developed market economies is with other developed market economies. The same pattern is observed within the centrally planned economies of Europe. Figures 3 to 6 give a graphical representation of the world trade in capital goods by economic grouping and regions of trading partners.

The world's leading exporters of capital goods in 1981 were the Federal Republic of Germany, followed by the United States and Japan; in the centrally planned economies it was the USSR. The main exporters in the developing countries belong to the new manufacturing countries in East Asia, followed by Brazil and Mexico in Latin America. These countries accounted for more than fifty per cent of the developing economies' exports. The data in table 7 show the imports and exports by branches in the developing economies and industrialized countries.

Table 7. Imports and exports of capital goods by developing and developed market economies, and average growth rates, 1970 and 1981, in constant 1975 millions dollars

	Developing economies				Developed market economies			
	Imports		Exports		Imports		Exports	
	1970	1981	1970	1981	1970	1981	1970	1981
381 Manufacture of fabricated metal products, except machinery and equipment	2,213	5,815	361	1,890	7.478	14.756	9,813	23,200
382 Manufacture of machinery, except electrical	9,709	25,810	552	3,265	35,426	68,690	47,644	104,175
383 Manufacture of electrical machinery apparatus, appliances and supplies	3,254	15,987	640	7,774	13,194	42.008	16.378	55,480
384 Manufacture of transport equipment	7,730	22,801	554	4,886	44,231	87.250	57,149	117,035
385 Manufacture of professional and scientific equipment, n.e.s.	545	2,514	32	496	3,626	9,440	4,394	12,489
Total 38, capital goods	23,461	72,926	2,138	18,311	103,954	222,145	135,378	312,378
Growth rates	1970-1981		1970-1981		1970-1981		1970-1981	
381 Manufacture of fabricated metal products, except machinery and equipment	9.2		16.2		6.4		8.1	
382 Manufacture of machinery, except electrical	9.3		17.5		6.2		7.4	
383 Manufacture of electrical machinery apparatus, appliances and supplies	15.5		25.5		11.1		11.7	
384 Manufacture of transport equipment	10.3		21.9		6.4		6.7	
385 Manufature of professional and scientific equipment, n.e.s.	14.9		28.3		9.1		10.0	
Global	10.9		21.6		7.1		7.9	

Source: UNIDO data base.

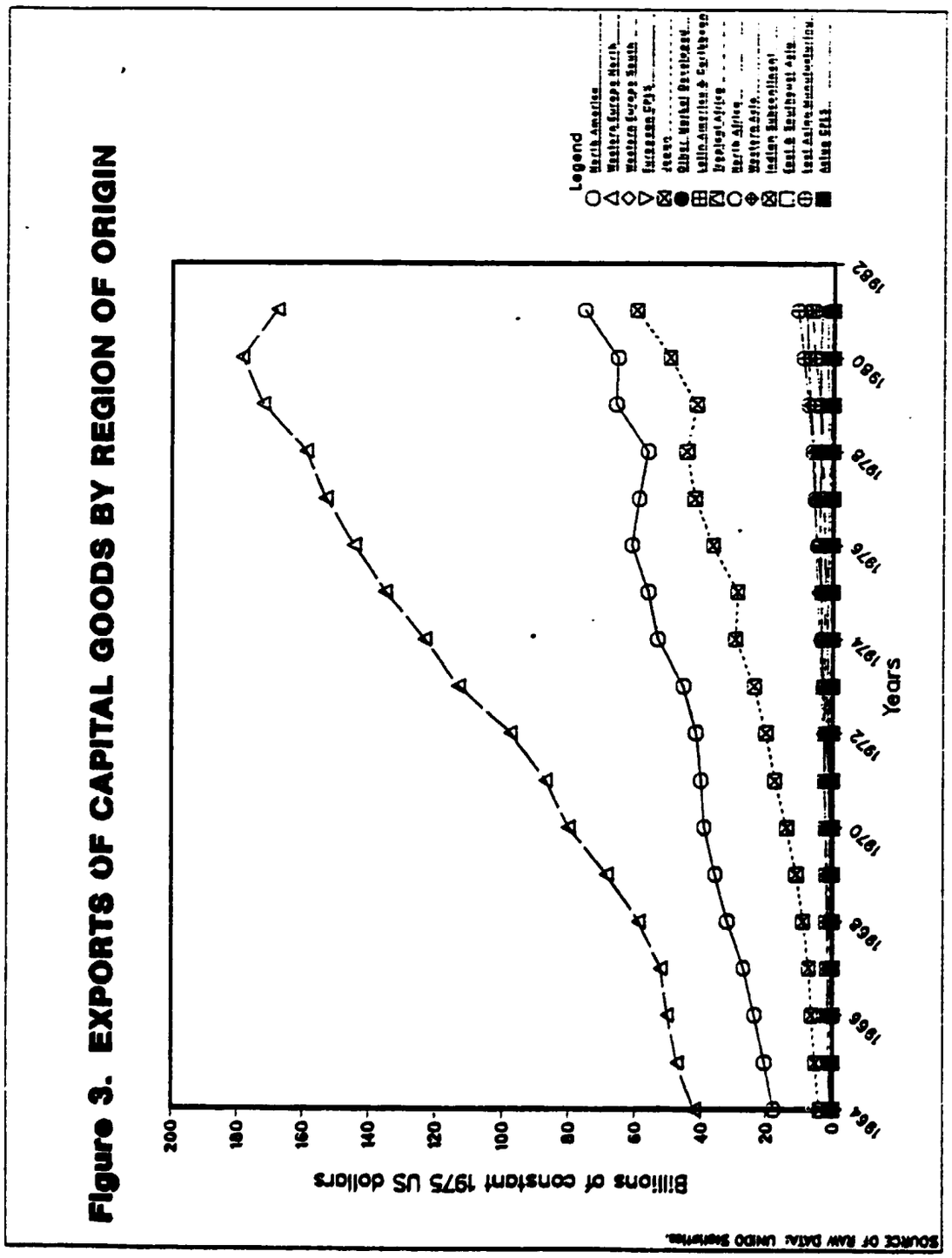
Figure 3. EXPORTS OF CAPITAL GOODS BY REGION OF ORIGIN
Billions of constant 1975 US dollars
200
180
160
140
120
100
80
60
40
20
0
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982
Years
Legend
SOURCE OF RAW DATA: UNIDO Statistics.

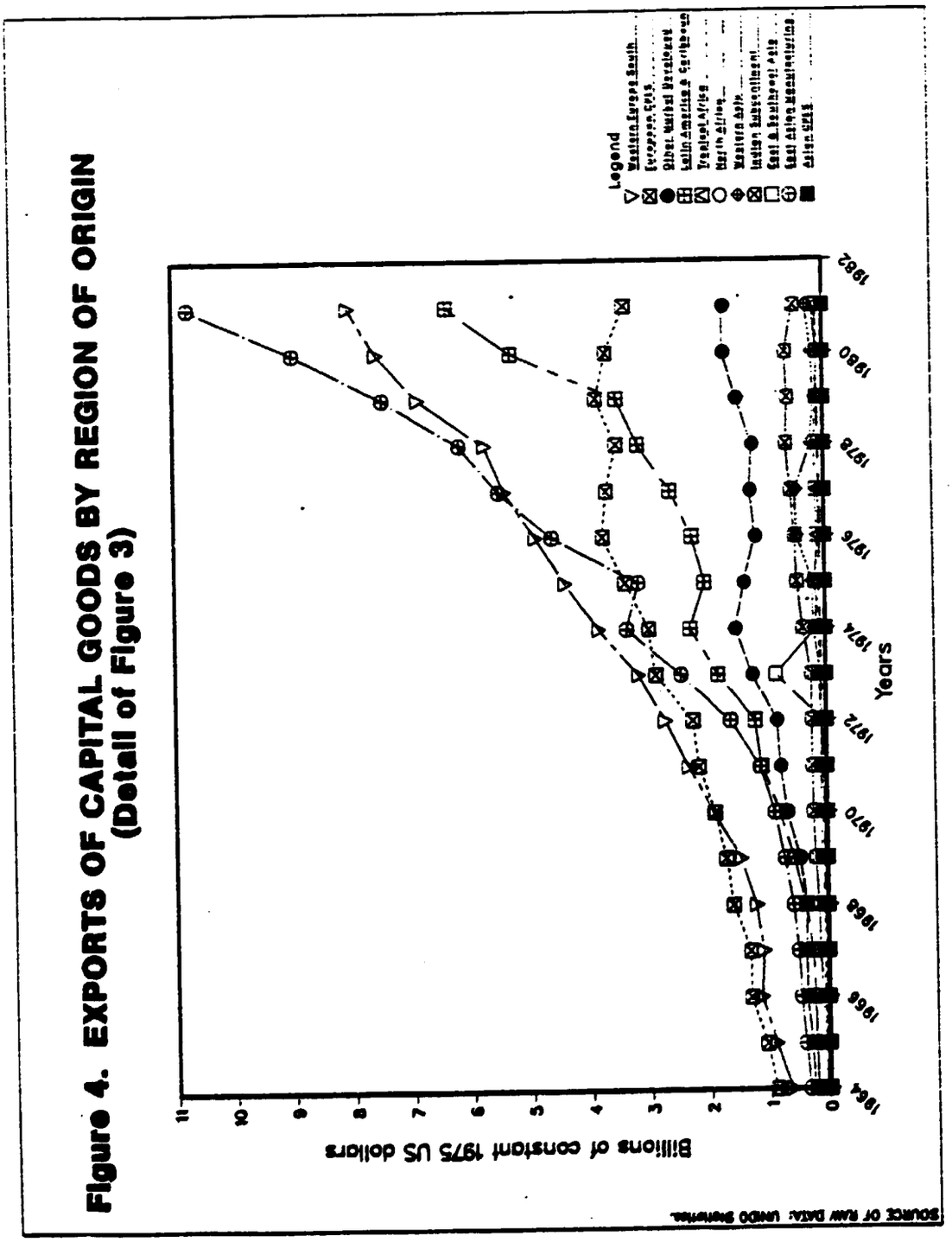
Figure 4. EXPORTS OF CAPITAL GOODS BY REGION OF ORIGIN
(Detail of Figure 3)
Legend
Billions of constant 1975 US dollars
Years
0
1
2
3
4
5
6
7
8
9
10
11
1962
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982

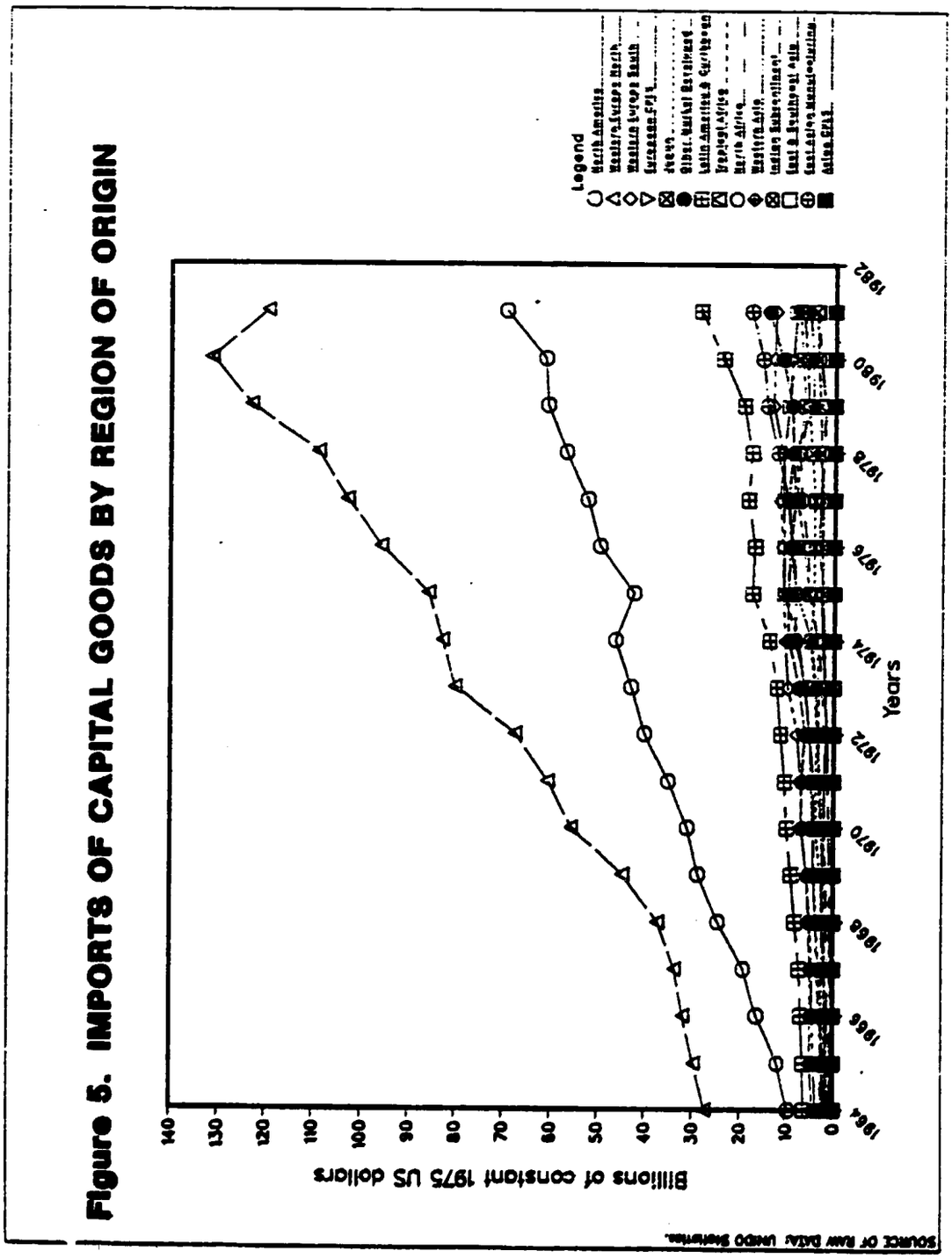
Figure 5. IMPORTS OF CAPITAL GOODS BY REGION OF ORIGIN
Legend
Billions of constant 1975 US dollars
Years
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
1964
1966
1968
1970
1972
1974
1976
1978
1980
1982

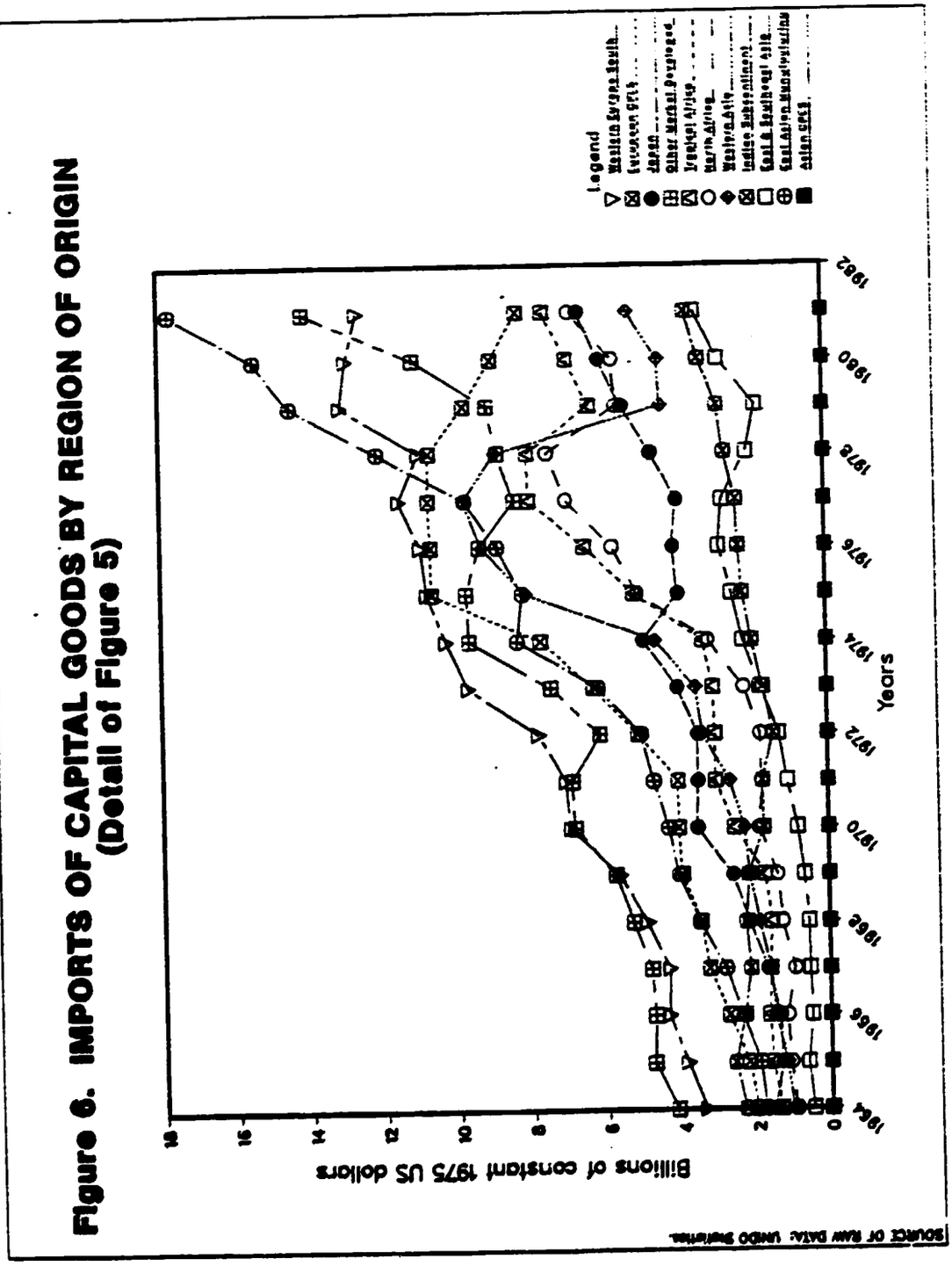

Figure 6. IMPORTS OF CAPITAL GOODS BY REGION OF ORIGIN (Detail of Figure 5)

8. PROJECTED VALUE ADDED IN CAPITAL GOODS

8.1 About the projections and their purpose

The projections cited in this chapter are summaries of more detailed forecasts and estimates given in a separate study on regional projections of value added in capital goods, which is under preparation. These projections are based on long-term forecasting models for the capital goods sector for each of the current 14 UNITAD model regions.[42/] In these models, the projected economic growth rates are taken as exogeneously given by the UNITAD model's Reference Scenario up to the year 1990, and simply extrapolated thereafter.[43/]

Five different types of capital goods are considered: metal products (corresponding to ISIC 381), non-electrical machinery (ISIC 382), electrical machinery (ISIC 383), transport equipment (ISIC 384), and professional and scientific equipment (ISIC 385). The projections for each product group are generated by a 3-equation, 2-stage econometric model that relates exports and imports to GDP in manufacturing and a trend factor, and subsequently, value added to trade in the sector. The model is estimated over United Nations Statistical Office (UNSO) data from 1964 to 1981, the last year for which reasonably complete data were available. Despite the simplicity of the models and the heterogeneity among the countries in most of the regions, the results are excellent statistically, and the estimated coefficients are very stable in most cases. This results in relatively tight projections (i.e. the probability or confidence limits for the projections are small) except for the sector 385 (mainly instruments) where the past performance has been erratic. It follows that the projection models are conditional on the historical

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42/ The regional breakdown is done according to the UNITAD model - a joint UNIDO/UNITAD model system for exploring prospective long-term changes in the world economy. This breakdown is standard practice in the Sectoral Studies Series providing consistency throughout the series.

43/ For explanation see also section 5.4 above.

developments of the sector and show where the regional production and trade would be in 1985, 1990 and in the year 2000, were the economic and other relevant structures of the sixties and seventies to prevail. Judged over all regions and all sub-sectors, the projections make economic sense under the assumption that the basic economic structure of the past will continue in the long run. It must be noted, however, that the econometric model does not explicitly account for business cycles but is secular in nature.

When the actual figures eventually become known they may differ even significantly from those presented here because of both short-term phenomena not considered in the models and structural, long-term changes in the regions. However, the main purpose of these projections is not to present very accurate forecasts but rather to provide valid information to policy makers and other decision makers in individual countries as well as in the international aid organizations on what the global capital goods situation is likely to be if no further action is taken to affect the sector's development and global distribution. It is of course assumed that such action will be taken, in order to avoid a deterioration of the developing countries' situation.

8.2 The longer term outlook for capital goods

Tables 8 to 12 give the actual 1980 value added in constant 1975 prices by major global region and by product group. In addition, these tables present the projected situation for 1985 and 1990 in index form to facilitate regional and sub-sectoral comparisons on a relative level. The absolute projected figures can be computed from the tables' information. However, the stress should not be put on either the precise indices or the corresponding absolute numbers but rather on the indicated direction and strength of the future development in capital goods.

In terms of global value added, non-electric machinery, electric machinery and transportation equipment are presently the three largest subsectors in capital goods, each accounting for approximately one quarter of a million dollars (in 1975 prices). In the future, however, this situation is

Table 8. Projected value added in metal products (ISIC 381) by Region, 1980, 1985 and 1990

	Constant 1975 million dollars	Index; 1980=100	
UNITAD Region	1980	1985	1990
WORLD	129,663	129	177
DEVELOPED MARKET ECONOMIES	78,242	127	168
N. America	30,555	140	202
W. Europe (North)	27,603	112	137
W. Europe (South)	6,664	114	143
Japan	12,245	139	176
Other	2,175	109	108
DEVELOPING COUNTRIES	9,456	136	212
Latin America	6,173	136	212
Tropical Africa	412	58	57
N. Africa	242	120	138
W. Asia	1,207	130	181
S. Asia	670	172	362
E. and S.E. Asia	248	165	242
E. Asia (Mfg)	504	164	238
CENTRALLY PLANNED ECONOMIES	41,965	130	186
European	40,255	130	186
Asian	1,710	143	189

Source: Regional Projections of Value Added in Capital Goods, forthcoming.

Table 9. Projected value added in non-electric machinery (ISIC 382) by Region, 1980, 1985 and 1990

	Constant 1975 million dollars	Index; 1980=100	
UNITAD Region	1980	1985	1990
WORLD	219,029	122	164
DEVELOPED MARKET ECONOMIES	143,120	116	149
N. America	56,170	114	151
W. Europe (North)	60,284	111	133
W. Europe (South)	2,210	115	141
Japan	22,353	134	190
Other	2,103	111	128
DEVELOPING COUNTRIES	10,823	145	228
Latin America	7,503	155	254
Tropical Africa	61	133	161
N. Africa	167	48	47
W. Asia	1,306	117	167
S. Asia	1,244	111	137
E. and S.E. Asia	143	152	215
E. Asia (Mfg)	399	200	321
CENTRALLY PLANNED ECONOMIES	65,086	131	186
European	54,776	129	185
Asian	10,310	142	189

Source: Regional Projections of Value Added in Capital Goods, forthcoming.

Table 10. Projected value added in electric machinery (ISIC 383) by Region, 1980, 1985 and 1990

	Constant 1975 million dollars	Index; 1980=100	
UNITAD Region	1980	1985	1990
WORLD	178,474	134	203
DEVELOPED MARKET ECONOMIES	118,309	133	203
N. America	41,575	157	256
W. Europe (North)	46,121	111	158
W. Europe (South)	4,196	130	169
Japan	24,992	136	206
Other	1,425	122	148
DEVELOPING COUNTRIES	11,882	141	245
Latin America	6,215	121	226
Tropical Africa	140	143	187
N. Africa	319	129	188
W. Asia	1,424	111	167
S. Asia	1,013	140	212
E. and S.E. Asia	564	173	279
E. Asia (Mfg)	2,2 7	210	369
CENTRALLY PLANNED ECONOMIES	48,283	133	195
European	46,258	133	196
Asian	2,025	133	176

Source: Regional Projections of Value Added in Capital Goods, forthcoming.

Table 11. Projected value added in transportation equipment (ISIC 384) by Region, 1980, 1985 and 1990

	Constant 1975 million dollars	Index; 1980=100	
UNITAD Region	1980	1985	1990
WORLD	183,766	125	178
DEVELOPED MARKET ECONOMIES	117,557	115	143
N. America	46,271	111	99
W. Europe (North)	47,321	98	147
W. Europe (South)	4,949	122	152
Japan	16,678	151	222
Other	2,331	77	123
DEVELOPING COUNTRIES	14,899	189	418
Latin America	10,604	206	493
Tropical Africa	260	160	184
N. Africa	599	37	42
W. Asia	938	184	277
S. Asia	853	131	232
E. and S.E. Asia	259	107	141
E. Asia (Mfg)	1,386	187	315
CENTRALLY PLANNED ECONOMIES	51,310	131	189
European	49,070	131	190
Asian	2,240	131	174

Source: Regional Projections of Value Added in Capital Goods, forthcoming.

Table 12. Projected value added in professional and scientific equipment (ISIC 385) by Region, 1980, 1985 and 1990

	Constant 1975 million dollars	Index; 1980=100	
UNITAD Region	1980	1985	1990
WORLD	68,400	129	191
DEVELOPED MARKET ECONOMIES	28,889	121	181
N. America	14,012	138	220
W. Europe (North)	7,390	105	132
W. Europe (South)	342	120	155
Japan	6,925	105	153
Other	220	153	261
DEVELOPING COUNTRIES	382	237	600
Latin America	146	185	463
Tropical Africa	0	-	-
N. Africa	0	-	-
W. Asia	2	500	850
S. Asia	73	205	829
E. and S.E. Asia	12	292	692
E. Asia (Mfg)	149	296	609
CENTRALLY PLANNED ECONOMIES	39,129	134	195
European	37,949	134	195
Asian	1,280	134	177

Source: Regional Projections of Value Added in Capital Goods, forthcoming.

expected to change gradually, electric machinery and transportation taking over as the dominant product groups. Non-electric machinery, and also metal products are expected to grow significantly slower than the other three groups.

As a group, the developed market economies are the largest producers in every sub-category of the capital goods. Similarly in all categories, the developing countries account for the smallest amounts of value added. But this situation is expected to change (see figure 7), notably in transportation equipment where the developing countries as a group may well have the dominant share in the world by the end of this century.

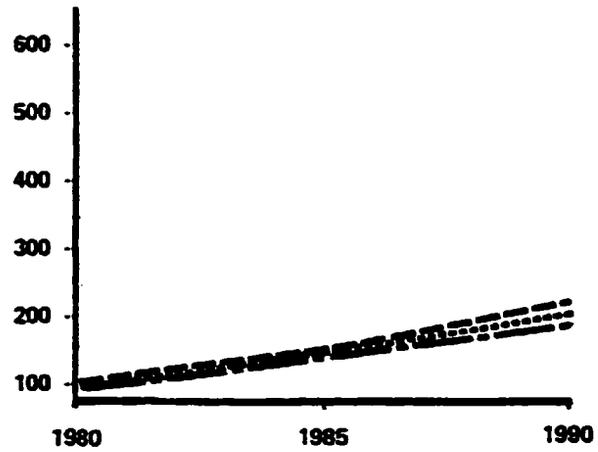
In other subsectors, too, the developing countries are predicted to increase their global share signigicantly. For example, in metal products, their share should increase from a present 8 per cent to 12 per cent by the year 2000, and in non-electric machinery from 7 to 10 per cent. Even in professional and scientific equipment they can be expected to increase their share from a mere 1 per cent now to 7 per cent in another 15 years. (The absolute amounts, of course, are still quite modest).

Within the developing countries, it is primarily Latin America that is projected to increase its share in the global value added in all categories of capital goods. The new manufacturing nations of East Asia are also expected to increase their shares somewhat. South Asia is expected to become a leading region among the developing countries in professional and scientific equipment, perhaps also in metal products.

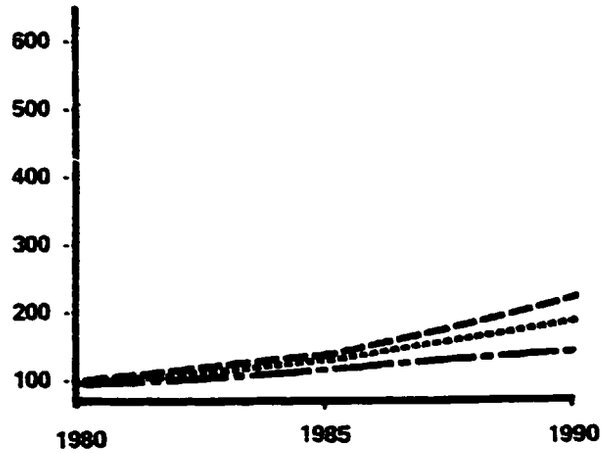
The centrally planned economies are projected to possibly slightly increase their present one third share in global value added in metal products and in non-electric machinery. But their share appears to fall in all other categories of capital goods although they are expected to still be the largest country group in professional and scientific equipment by the end of the century.[44/]

44/ Their present share is estimated at 59 per cent. It is possible that it is so high because of a different practice in classifying certain items than in other countries.

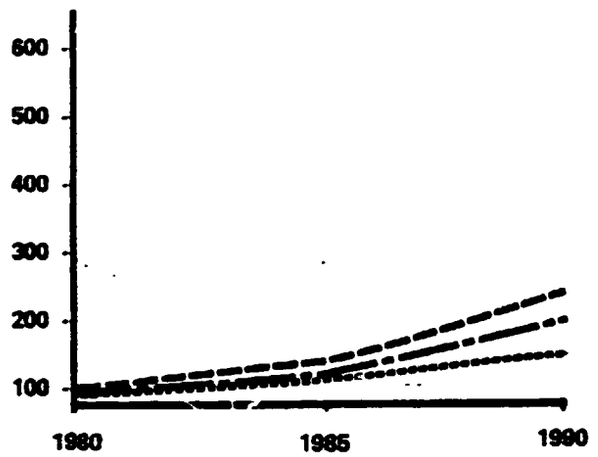
METAL PRODUCTS



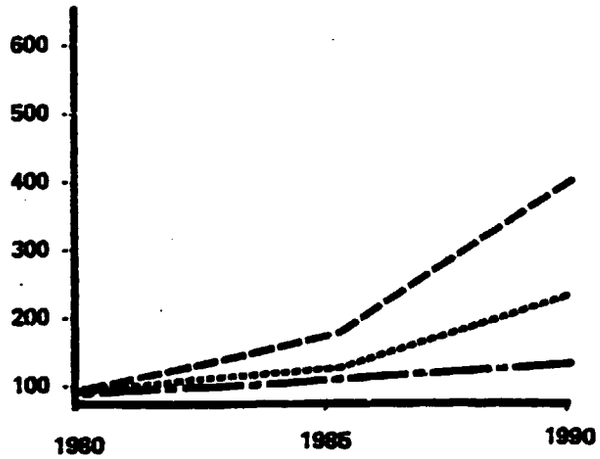
NON – ELECTRIC MACHINERY



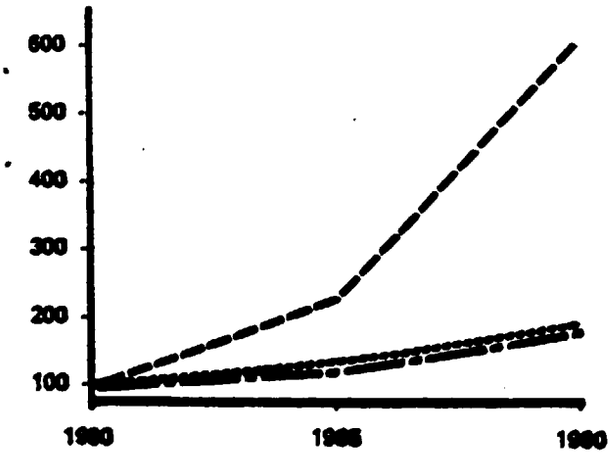
ELECTRIC MACHINERY



TRANSPORTATION EQUIPMENT



INSTRUMENTS AND PROFESSIONAL EQUIPMENT



LEGEND :

DEVELOPED MARKET ECONOMIES

DEVELOPING COUNTRIES

CENTRALLY PLANED ECONOMIES

Fig. 7 : Projected Valued Added and Capital Goods, 1980 = 100

The developed market economies appear headed for a significant relative decline in their metal products, non-electric machinery and transportation equipment subsectors. Although still the dominant producers in absolute value added terms, their shares in these product groups are predicted to fall from approximately two thirds to only a little better than one half of the global value added. But in sophisticated machinery and equipment they are expected to maintain their already substantial shares (66 per cent in electric machinery and 40 per cent in professional and scientific equipment). Within these two latter product groups, North America is predicted to increase its share substantially but it is expected to experience a drastic relative decline in its transportation equipment subsector. Western Europe is seen to be losing ground in all categories of capital goods. Japan, surprisingly perhaps, on the whole, does not appear to be doing much better than maintaining its present shares in global value added; metal products may be declining somewhat whereas non-electric machinery is expected to gain a few percentage points in terms of global shares.

Africa, then, is the global region that does not appear to be likely to improve its position in capital goods, neither in terms of absolute production levels nor in global shares. Some subsectors are predicted to grow fairly fast but the absolute numbers remain so small that this growth does not amount to much, especially if it is put in relation to population growth or in relation to needed capital investment in Africa. Some subsectors are even expected to decline in absolute terms from their present (and very modest) levels. Herein lies perhaps the gravest message of these predictions. If nothing more and/or better is not done than hitherto, Africa is going to continue to be the poorest equipped region in the world. Whereas some other developing regions or countries can be expected to do well on their own or with present level assistance, Africa's capital goods sector needs substantial and effective attention both from within the region and from the international community.

8.3 The very short-term outlook for capital goods

In many manufacturing sectors, and in many countries, the short-term outlook is characterized by idle global capacity, intense international competition, and rapid technological change. In such a situation, the choice for many producers may be to invest or face closing down. Following the recent recession, apparently many of them have chosen to try an investment strategy. In the United States alone, the demand for domestic-made capital goods was up by 24.1 per cent in the two first years of the present economic expansion[45/] - that is a much greater rise than in the two previous business cycles, and it comes in addition to much expanded imports of capital goods.

North America produces more than one half of all the world's total output of capital goods, and depending on the product group constitutes from 10 to 20 per cent of the world's export market for capital goods.[46/] Moreover, since the United States is the only country for which detailed and recent figures on the past and the expected performance of the capital goods sectors are readily available, it is justified to look at some of these figures in the present context as well.

The very short-term outlook continues to be strong: orders for non-defense capital goods in the United States climbed to $US 30 billion in February 1985 up $US 6.8 billion from the January level. At the same time, new orders for machine tools rose by 12 per cent and although imports have captured 40 per cent of the United States market, domestic orders were still 17 per cent ahead of last year. Product group-wise, the automobile manufacturers plan to expand their capital budget for 1985 by 30 per cent, the steel manufacturers by 19.6 per cent and the electric machinery producers by 15.5 per cent. Given that imports will continue to play a major role on the

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45/ These, and following statistics in this section for the United States, are quoted from Business Week, various issues from January to April 1985.

46/ See UNIDO/IS.505, op.cit., section A and D.

United States' markets (during the first 9 months of 1984, imports accounted for fully 42 per cent of all domestic machine tool sales), these figures are also of importance for the world's other producers of capital goods.

For the world's other producers of capital goods there will in all likelihood continue to be a strong market for their goods in the United States in the short run, particularly if the American dollar continues to be strong. Important for the long run is that imports to some extent have replaced United States manufacturing of several types of capital goods as American producers have begun to shut down non-profitable or marginal product lines. Still other United States suppliers have established marketing agreements with foreign suppliers to sell their merchandize. Eventually, the United States companies are likely to move from mere marketing agreements to joint production ventures with foreign manufacturers.

It is not only manufacturers of capital goods in other industrialized countries that stand to gain from the urgent need to modernize machinery and otherwise invest in plant equipment in North America and Europe. Thus the newly industrialized countries in Latin America and in East and South East Asia are increasing their exports of capital goods at a very high rate (for certain products, up to nearly 20 per cent per annum). Furthermore, the developing countries themselves will have to devote an increasing share of their total investments to capital goods if they intend to increase their manufacturing capacities and keep their import bills manageable.
The potentials for exporting technologies from the developing countries to the developed ones also exist. These include adaptations of existing technologies to limitations and adverse conditions such as low energy supply and high humidity. These adaptations are, for various reasons, only now becoming of greater interest in developed countries as well. Genuine technological innovations in the production of capital goods can of course also flow from a developing country.

The capital goods sector in the United States is estimated by Data Resources Inc. (DRI) to have grown in 1984 in real terms by some 18 per cent over 1983,[47/] following a real decline of -4.7 per cent from 1982 to 1983. Despite the very high growth figures for the beginning of this year cited above, the growth in the capital goods sector for the entire year 1985 is expected to slow down to 3.2 per cent in real terms. Product-wise, DRI predicts that the annual growth in output of general industrial machinery will fall to 3.4 per cent from 16.5 per cent last year. Similarly, the rise in production of non-electrical machinery is expected to fall to 5.6 per cent from the 18 per cent gain achieved in 1984. Even electrical machinery and instruments, which includes many high-technology items, are predicted to grow at a relatively modest rate of 5.6 per cent in 1985, compared to 1984's gain of 11.2 per cent. Not unexpectedly, the fastest growth is forecast for the manufacturers of such high-technology items as computers, communications equipment and robotics; their output is forecast to grow by 9 per cent this year according to DRI.

Marketing skills, not just production technology, will become increasingly important for the producers of capital goods. Quickly spreading information on new technologies and rapidly emerging new producers have made relatively inexpensive components and whole systems of capital goods readily available to the users (e.g. micro computers). Technological advantages are no longer expected to last very long. Instead, a host of new applications in products spring up soon after the original innovation was introduced. Thus, the success in manufacturing becomes a battle of marketing and finance as much as of production. The future strategies for industrialization must reckon with these facts.

47/ As quoted in Business Week, 14 January 1985.

PART TWO

A REGIONAL ANALYSIS OF THE CAPITAL GOODS INDUSTRY IN DEVELOPING COUNTRIES

9. SUMMARY AND CONCLUSIONS

UNIDO has carried out studies of the capital goods industry in Latin America, Asia, Africa and the Arab Region. The studies contain an analytical appraisal of the capital goods industry in the region and try to identify the basic issues and a first appreciation of possible strategies. The surveys have been undertaken in varying contexts and with somewhat different methodologies. They do not therefore cover all developing countries nor are they entirely comparable. Nevertheless, an attempt to present the main findings of these reports is made below. Much more detailed information can be found in the regional reports.[48/]

The manufacture of capital goods is essential for industrial development but it also requires industrial markets for its own development. This is amply demonstrated in the regional analyses. Developing countries have adopted mainly two kinds of policies in this respect. Either they have been able to rely on sizeable domestic markets or they have embarked on vigorous export drives. In the first case, the main policy instrument has been import substitution through trade barriers and local content laws. In terms of industrialization, this has been fairly successful in Latin America but less so in South Asia. A major reason for these very different results can be found in the underlying production of capital goods. The large Latin American countries have a fairly balanced industrial fabric which means that the local industrial manufacturing is backed up by the necessary ancilliary industries such as capital goods. This is being reinforced by laws that may require up to 85 to 95 per cent local content. In addition, some Latin American Governments offer export incentives for manufactured products and duty-free imports of certain capital goods.

48/ The documents prepared by regions are as follows:
1. Arab Trade in Capital Goods (UNIDO/IS.421)
2. Arab Demand for Capital Goods in the Short, Medium and Long Term (UNIDO/IS.451)
3. The Capital Goods Industry in Latin America: Present Situation and Prospects (UNIDO/IS.478)
4. The Capital Goods Industry in Africa (UNIDO/IS.502)
5. The Capital Goods Industry in Asia (forthcoming).

In contrast, South Asia has a very fragmented industrial fabric. In some instances the region has very sophisticated production (computers, for example) but at the same time problems in producing a range of necessary basic industrial products. The impact of government policies on investment in general and expansion in particular has been uncertain in several countries. Nevertheless South Asia's capital goods industry (and with it, other industry) is now expected to grow vigorously in the near future, aided by a certain reorientation of industrial policies.

The new manufacturing countries of South East and East Asia have based much of their industrialization on a protection of their domestic markets coupled with vigorous exports of selected manufactures. This choice of strategy is logical since their domestic markets are not nearly as large as those in many of the Latin American and South Asian countries. The strategy is supported by a balanced industrial fabric, including the manufacture of basic capital goods, and/or relatively free import of raw materials, machinery and spare parts. The choice of industrial products to produce has also been pivotal. In capital goods, it is the manufacturing and subsequent export of minor mechanical components where the production is relatively labor intensive that these countries have been most successful, in addition to assembly of electronic products and shipbuilding. This is also extremely important for the industrial future of these countries. Since wage costs are only one element, to be competitive in industrial production at large, the component industry must be diversified and producing products of necessary quality. This later aspect is still a sore point in much of the region's industrial production.

The dilemma, then, for a region like Africa is that, it has neither a balanced industrial fabric for the production of basic manufactured goods such as simple capital goods, nor does it have the foreign exchange to import them. Yet, the region must expand its industrial capacity and exports of manufactured goods to improve its balance of payment and living standards in general. Positive experiences of other regions can here serve as guidelines for the development of Africa's industrial policies.

Because of the difference in regional characteristics and the different perspective of the regional studies, caused by specific requests from regional organizations or the availability of information on individual regions, the regional studies and recommendations exhibit some heterogeneity. However, a number of common problems and requirements for solving these problems emerge. The most important of these are:

(a) The need for much improved regional and sub-regional co-operation between the developing countries to extend the accessable markets for capital goods is required. Technological complementation, sub-contracting, and formulation of development plans are important aspects of such co-operation.

(b) The need for a new and vigorous approach to development of software, i.e. engineering and design capabilities, for capital goods development.

(c) In close relation to point (b) above but also an important point on its own, the need to upgrade skills at all levels in this sector.

(d) In relation to the points above, the establishment and assimilation of international standards for the sector will aid in South-South co-operation, human resources mobility and development within the sector, and enhancement of the engineering fabric of the developing countries.

(e) The rationalization of the important role the state can play through procurement policies; establishment of long-term policies and plans, improvement of the economic and financial context in which the industry can grow, and through an active role in the promotion of international co-operation.

(f) The recognition of the economically sound role that also the small enterprise can play in the provision of locally produced, appropriate capital goods. The need to develop ancilliary firms of all types to fill the gaps that exist in the industry fabric of many developing countries in engineering design, components procurement, subcontracting, etc.

(g) The new technological developments especially the microelectronics, affect the industrial development in two ways: as an industrial sector itself and as industrial technologies in any sector of industry. As a sector of industry the manufacture of microelectronic components and equipment constitutes one of the key world industrial sectors. The opportunities for developing countries should, therefore, be analyzed in depth. Furthermore, the impact of the introduction of these new technologies in different industrial sectors should be strongly analyzed.

10. THE LATIN AMERICAN REGION

10.1 Global Overview

Latin America and the Caribbean can be divided into three groups of countries with respect to their industrial development: the three large countries Argentina, Brazil and Mexico with approximately 78 per cent of the region's industrial installations; the five medium-sized countries Chile, Colombia, Peru, Uruguay and Venezuela with 16 per cent; the eleven small countries Bolivia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Nicaragua, Panama and Paraguay with approximately 6 per cent of industry. Not included in this grouping are Cuba and the English-speaking Caribbean countries, of which Jamaica and Trinidad and Tobago have a certain importance in the capital goods sector.

Industrial value added stood at approximately $US 229 per capita in Latin America in 1982, whereby the three large countries averaged $US 280 (Mexico is leading with $US 342), the medium-sized countries averaged $US 176 and the small ones averaged $US 88. For Asia this figure was $US 34 and for Africa $US 29 in 1981.

The composition of industrial production has changed considerably in the last three decades with non-durable consumer goods going from two-thirds of the industrial production in 1950 to only one-third in 1977. In the same period the importance of the metalworking industry rose from 11 to 24 per cent. In Brazil the metalworking sector contributed approximately 30 per cent to the industrial value added, in the Andean Pact countries approximately 15 per cent, and in the Central American Common Market (CACM) approximately 9 per cent at the end of the 1970s. These figures indicate clearly the more advanced stage which Brazil has reached and the growth potential which exists for the medium-sized and small countries in the metalworking and capital goods sectors, if appropriate measures to develop this industrial activity are taken. This possibility receives support if one takes a closer look at the composition of value added at the subsector level.

A comparison of the different three-digit ISIC product groups composing the metalworking sector indicates additional interesting features: fabricated metal products (ISIC 381) surprisingly contribute to the same extent to the value added in Brazil, the Andean Group and the CACM countries, i.e. around 4 per cent to 5 per cent in the mid-1970s. In these countries except Brazil, this product group contributed considerably to the growth of the sector. Product group 381 generally develops prior to others in the metalworking sector.

The production of non-electrical machinery (ISIC 382) reached almost 9 per cent of industrial value added in Brazil in 1973 and fell back again, in accordance with the reduced growth of the entire manufacturing sector, to roughly 7 per cent in 1978. The Andean Pact countries have reached an intermediate stage with almost 4 per cent, whereas the Central American countries show hardly any development in this sector since 1960, its share oscillating around 1 per cent.

The strongest growth in Central America, however from a very low level, is in electrical machinery and equipment (ISIC 383) increasing its share from 0.3 per cent in 1960 to 1.8 per cent in 1975. The corresponding figures for the Andean Pact countries are roughly twice as high: 3.7 per cent in 1975 and 4 per cent in 1977. The figure for Brazil was approximately 5.6 per cent in 1975 and 6 per cent in 1978. In other words, the Central American share in industrial value added of the electrical machinery and equipment sector in the mid-seventies corresponds approximately to the value of the Andean Pact countries of the mid-sixties and to Brazil in the late 1950s.

The most rapid development in Brazil was observed in the transport equipment sub-sector (ISIC 384), the share of which grew by a factor of 9 between 1955 and 1978 to achieve 11 per cent of industrial value added. The contribution of the transport industry to value added in the Andean Pact countries almost tripled from 1.4 per cent in 1950 to approximately 4 per cent in 1975, falling back to 2.8 per cent again in 1978 (in Venezuela alone, the share of this product group is above 5 per cent for the late 1970s). Yet in Central America, the transport industry showed no upward development; it varied between 1.5 per cent and 1.8 per cent of manufacturing value added between 1960 and 1975.

The major contribution to Brazil's dynamic development in the metalworking industry comes from the transport industry, especially from the automotive sector. The Andean Pact countries also have developed an automotive industry going beyond pure assembling of passenger vehicles. However there have been some setbacks and constraints in this field. Due to economies of scale, Central America will face major problems in developing its own passenger car industry based on a considerable local content. Therefore, different approaches to the future development of the metalworking sector must be considered. Central America will have to look for production possibilities where economies of scale do not have the same limiting constraints as in passenger car construction. Considering the transport sector, the possibilities most probably will be limited to truck and bus assemblies, special transport equipment and railroad equipment (on a limited scale).

The production of scientific and professional equipment (ISIC 385) is small in Central America, contributing only 0.3 per cent to the industrial value added in the Andean pact countries and 0.7 per cent in Brazil. Its economic importance to this region therefore lies in its value in terms of technological progress.

The portion of the total investments going into the manufacturing sector is especially high in the large countries, decreasing in the medium-sized and small countries. In 1977, the manufacturing sector absorbed three-fourths of the total foreign investment in the three large countries, one-third in the medium-sized ones, one-fifth in the small countries and one-tenth in the even smaller Caribbean countries. All groups of countries, except the Caribbean, absorbed a higher portion of foreign investments in the manufacturing sector in 1977 than in 1967.

The contribution to manufacturing GDP of the foreign enterprises represented 16 per cent in 1966 and 19 per cent in 19 Latin American countries in 1975. While manufacturing GDP grew by 7 per cent in these 10 years, the part generated by the foreign companies grew by 9 per cent. This partly reflects the fact that transnational corporations select those sectors of manufacturing activities which have above-average demand growth rates. For example, in Brazil's non-electrical machinery sector, with an annual growth

rate of 16 per cent, transnationals had a 75 per cent market share. In Brazil's transport sector with an annual growth of 15 per cent, transnationals had a 94 per cent market share.

Statistical data on the participation of the transnational corporations in exports are scarce. In 1975, 94 per cent of the goods manufactured in Latin America by transnational corporations based in the United States were sold on the local market, leaving 6 per cent to be exported. Yet there are great differences by sector and by country. For example, the export share in metal products, machinery and equipment of transnational corporations was approximately 36 per cent. In Brazil in 1976, the transnationals accounted for approximately 95 per cent of the exports of transport equipment and 71 per cent of electrical machinery. In Argentina, their export share in manufactured products was 42 per cent in 1973.

Production of capital goods is relatively advanced in the three big countries, moderately developed in the medium-sized countries and incipient in the small-sized ones. Production in the medium- and small-sized countries can be increased through specialization, regional or sub-regional complementation of production, and sub-contracting.

Statistical records on production, especially on a product or product-section basis, are incomplete in Latin America and homogenous statistical records are not available. To the extent possible data on production of capital goods in Latin America are presented in the accompanying UNIDO regional study on capital goods.[49/]

Table 13 shows the imports of capital goods into Latin American countries from 1976 to 1981. Very remarkable are the increases in Mexico's imports which more than tripled in current values from 1978 to 1981 and Peru which show annual imports more than tripling in the same period. Other countries

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49/ UNIDO/IS.478, op.cit.

Table 13. Development of Capital goods imports in 19 Latin American countries, 1978-1981 (millions of $US, index 1978 = 100)

	1978 million $US	Index; 1978 = 100		
		1979	1980	1981
Argentina	1,384	113	173	130
Bolivia	365	116	100	104
Brazil	3,552	106	123	113
Colombia	1,557	107	100	139
Costa Rica	281	123	100	78
Chile	841	112	151	171
Ecuador	827	72	73	71
El Salvador	268	77	45	34
Guatemala	363	93	79	83
Haiti	43	126	146	84
Honduras	230	107	130	111
Mexico	1,981	181	254	363
Nicaragua	113	41	97	185
Panama	125	120	150	163
Paraguay	107	127	146	150
Peru	458	151	246	338
Dominican Republic	216	105	128	1.)
Uruguay	106	164	260	216
Venezuela	4,739	90	94	105 a/
Total	17,456	111	135	150

a/ Estimated.

Source: Division of Statistics, ECLAC, 1981 Economic Study.

worth noticing in this context, are Uruguay and Nicaragua which roughly doubled their imports and El Salvador which shows a sharp decline in 1981 to approximately one-third of its 1978 value.

Table 14 provides export figures for selected Latin American countries in 1980. The predominance of capital goods exports by Brazil (approximately 72 per cent of total capital goods exports of the selected group of countries in 1980) is striking. The three big countries Argentina, Brazil and Mexico account for 95 per cent of these exports.

Colombia's exports to the Latin American Integration Association (ALADI) countries amounts to 80 per cent of its exports; a more detailed disaggregation of its figures would most probably show that most of these exports go to the Andean Pact countries, which form part of ALADI. The low share of Mexico (approximately 17 per cent) shows its relatively minor integration into ALADI, its main customers being the United States of America and Central America. Argentina exports approximately two-thirds of its capital goods to ALADI countries. Brazil has been successful in penetrating additional markets outside of Latin America. Thus, its exports to the ALADI countries are less than one half of its total exports of capital goods.

The investments in capital goods in 19 Latin American countries from 1976 to 1981 are shown in table 15. The average annual growth rate of investment between 1976 and 1981 was the same as for imports, viz. 4.2 per cent albeit this time in constant values. Chile showed the highest increase, as its investments almost tripled. Investments almost doubled for Nicaragua and the two oil-exporting countries Ecuador and Mexico. Colombia and Uruguay invested roughly 66 per cent more in capital goods in 1981 than in 1976. Paraguay invested roughly 50 per cent more in 1981 than in 1976. The Dominican Republic invested 40 per cent more. Remarkable decreases occurred in Bolivia (down by 44 per cent), El Salvador (down by 36 per cent), Brazil (down by 14 per cent), Guatemala (down by 12 per cent). It should be kept in mind that in many cases local factors might obscure general trends, e.g. the construction of the Itaipú Dam has a greater influence on Paraguay, where the capital goods sector is relatively little developed, than on Brazil.

Table 14. Exports of capital goods by selected Latin American countries, 1980

	Total (million $)	Percentage	Exports to ALADI countries (million $)	Percentage	Percentage ratio of total exports to ALADI
Argentina	428.2	12.7	270.9	18.1	63.3
Brazil	2,417.3	71.7	1,085.9	72.4	44.9
Chile	65.0	1.9	15.3	1	23.3
Colombia	66.6	2	52.2	3.5	79.1
Mexico	359.7	10.7	61.6	4.1	17.1
Venezuela	35.2	1	14.2	0.9	40.3
Total	3,372.0	100	1,500.1	100	44.5

Source: Division of Statistics, ECLAC.

Table 15. Investments of 19 Latin American countries in capital goods, 1976-1981 (million $US at constant 1970 prices)

	1976	1977	1978	1979	1980	1981
Argentina	2,597.1	3,547.2	2,766.5	3,117.0	3,392.9	2,303.8
Bolivia	164.0	162.5	190.3	148.5	107.7	91.7
Brazil	10,035.4	8,699.8	9,092.3	9,420.6	9,964.5	8,600.2
Chile	338.1	461.3	563.9	646.5	784.9	902.6
Colombia	1,723.0	1,798.9	2,094.8	2,295.3	2,636.7	2,835.0
Costa Rica	192.5	229.1	263.6	294.1	246.3	168.2
Dominican Republic	248.7	272.1	255.0	324.3	325.2	344.6
Ecuador	369.4	443.7	537.8	536.9	600.8	579.7
El Salvador	231.1	283.3	320.2	290.7	179.0	146.6
Guatemala	325.7	356.5	391.3	345.6	278.6	285.7
Haiti	57.5	64.3	70.2	64.0	67.8	66.9
Honduras	130.9	147.4	198.4	208.3	215.6	175.8
Mexico	6,569.1	5,785.9	6,802.2	8,821.5	10,388.7	12,384.0
Nicaragua	92.2	151.7	85.3	34.1	101.0	182.8
Panama	199.4	154.7	184.4	182.0	178.4	-
Paraguay	159.3	207.3	222.2	249.8	257.2	244.6
Peru	963.7	740.7	594.1	642.7	847.1	1,092.5
Uruguay	184.1	208.4	168.7	238.0	330.2	244.1
Venezuela	2,725.9	3,748.9	3,469.1	2,576.6	2,491.8	2,992.8
Total	27,307.0	27,463.5	28,270.2	30,437.2	33,394.5	33,641.8

Source: Division of Statistics, ECLAC.

10.2 Projected development of demand for capital goods in Latin American countries[50/]

Electrical power equipment. Even if reduced economic growth in the next five years reduces energy demand in Latin America, the growth potential of electricity generation, especially hydroelectric generation, will most probably develop quite favourably. For the already initiated hydropower projects, approximately 700 turbines and corresponding generators, transformers and other electric equipment will be needed. Together with the hydropower sets under construction at the present time (237 units), the demand for turbines will add up to approximately 950 units by 2000, increasing the installed capacity by roughly 136 GW.

The new installations in thermoelectric units (approximately 130 planned units and 120 under construction) amount to 250 plants. The average size of the hydroelectric plants is estimated to be 142 MW, for the thermopower plant the size is estimated at 172 MW.

This expansion plan for electricity generation will bring about a corresponding demand for power and distribution transformers, switchgears, sub-stations and power transmission lines. The required power transformer capacity is estimated at 144 GVA, and, partly caused by the great distances in Latin America, the length of transmission lines of 100 KV or more is calculated to be approximately 60 thousand km.

The annual investment figures for hydroelectricity generation during this decade amounts to $US 8.7 billion, of which $US 3.5 billion is to be spent on machinery and equipment. This figure represents approximately 9 per cent of the total demand for capital goods in the different sectors.

50/ (UNIDO/IS.478), op.cit. This study is based on and summarizes a major work done within the context of a regional capital goods project RLA/77/015 mainly implemented by ECLAC.

Pulp and paper machinery. According to the ECLAC projections, forty-six new plants will be required for chemically produced pulp and sixteen for mechanically produced pulp. The average plant size would be 100 thousand tons per annum and 60 thousand tons per annum for pulp produced both chemically and mechanically.

Based on average costs of pulp plants, the demand for pulp production equipment amounts to $US 2.0 billion for the period up to 1991.

Cement producing machinery. In Latin America and the Caribbean, there exist 170 cement plants, of which 150 are in ALADI countries. The other Spanish-speaking countries have 13 plants, six are installed in Cuba and seven are located in the Caribbean and Suriname. The following demand analysis concentrates on the ones installed in ALADI and CACM countries.

Installed production capacity is 77 million tons per annum; 25 per cent of this is based on the technically outdated wet production process. Ninety per cent of the production capacity is based on natural gas or fuel oil, but conversion to coal is underway in many installations.

In 1981 plants with a production capacity of approximately 24 million tons per annum were under construction or put into operation. In the period 1982-1985, 41 new plants will be constructed, and 98 more between 1986 and 1991, giving a total for the 10 year period of 139 plants (rotary kilns) with an estimated production capacity of approximately 104 million tons (see table 36). Total investment for the machinery and equipment for these plants is estimated at $US 7 billion.

The medium-sized and small countries will have a joint average annual demand of approximately 2.6 plants per year but the bulk of the demand for new cement factories will originate in the three large Latin American countries. Approximately 25 per cent of the value of the equipment (and 40 per cent of the weight) can be produced by the medium-sized and small countries alone.

Steelmaking equipment. It is hardly possible to estimate the future demand for capital goods in the steelmaking sector under the present circumstances. First, among the Latin American steelmakers themselves, the plans for and opinions about the future are unclear. Two years ago the estimates for 1990 steelmakers' investments were in the order of $US 55 billion ($US 1,000 per ton of steelmaking capacity). This figure has been reduced lately to a maximum figure of $US 39 billion, a probable figure of $US 33 billion and a minimum figure of $US 23 billion. However, the difficulties for steelmakers in the other parts of the world, the reduction in production output of the metalworking industries in Latin America, and the slowdown in investment in general give grounds to fear that even the average investment figure of $US 33 billion for 1990 is highly optimistic. Moreover, the amount of 33 million tons of steelmaking capacity, equivalent to $US 33 billion, represents more than 90 per cent of the present capacity. Maybe one should consider a period until 1995 for such an investment development in order to allow time for a recovery in steel production or even extend the period to 2000 if negative gross investment figures do not show an upturn by 1984.

With respect to possible local production, 100 per cent of the steel structures can be locally supplied, as well as 80 per cent of the cranes, 70 per cent of the reheating furnaces, 50 per cent to 60 per cent of steelmaking furnaces or direct reduction equipment and 30 per cent to 60 per cent of the different types of rolling mills. Local supply possibilities for other equipment items are marginal or reach a maximum of 30 per cent. The percentages refer to the weight of the equipment.

Merchant ships. For the decade until 1990, the demand for merchant ships has been estimated as follows:

- Demand due to expansion of fleet: 4.6 million GRT
- Demand due to renewal of fleet: 2.1 million GRT
- Total: 6.7 million GRT.

The major demand is for bulk carriers (17 per cent), common cargo ships (12 per cent), tankers (11 per cent), combinations (9 per cent), rapid cargo ships (5 per cent) and roll-on-roll-off ships (3 per cent). Demand for gas

tankers, container ships, chemical tank ships and vehicle transporters lies between 1 per cent and 2 per cent each; the remaining demand is for other types of ships.

The possibility for the participation of medium-sized and small countries in the construction of merchant ships has been reduced. One of the determining factors is the world-wide excess capacity of ships, continuous specialization in the shipbuilding industry and strong subsidies to the shipbuilding industry in many countries. It might be interesting for medium-sized countries to expand their shipbuilding for fishing (such as Peru) or overhaul and repair ships (Chile, the Dominican Republic or Jamaica), since good possibilities exist to serve regional markets, especially in the Caribbean.

Agricultural machinery.[51/] Total Latin American imports of agricultural machinery reached $US 650 million in 1981, at constant 1975 prices, up from $US 445 million in 1971. This represents an annual real growth rate of 3.9 per cent. The region's share in world imports did not show any significant change. Total exports rose to $US 146 million in 1981, up from $US 15 million ten years earlier, representing an annual real growth rate of 25.8 per cent. It is interesting that the recent recession appears to have affected imports much more severely than exports, which remained in 1981 at about the 1980 level or even increased slightly for some product groups, whereas imports in all products categories decreased dramatically.

The import share of tractors is 10 per cent higher than that of other product categories. The import share of harvesting machinery shows fluctuation over the years. Lately the share of cultivating machinery has decreased, reaching around 1.7 per cent in 1981, the level of 1975.

In 1971, Latin America accounted for 0.3 per cent of the world exports of tractors. This share increased constantly until 1975 reaching 3.5 per cent in 1981. The second item in importance is cultivating machinery whose share in

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51/ UNIDO, Survey of the Latin American agricultural machinery industry, Sectoral Studies, Series No. 6, UNIDO/IS.407 (1983)

world exports increased from 0.8 per cent in 1971 to 1.8 per cent in 1977 and 1.5 per cent in 1981. In the case of harvesting machinery, the share of around 1 per cent has not undergone substantial changes in recent years.

Future demand in this sector depends heavily on government policies and overall income developments. The experience of recent years also shows that the overall demand for agricultural machinery follows closely the demand of the central product of this sector, i.e. the tractor. Based on this, it is estimated that the demand for the agricultural machinery will be in the order of a magnitude of $US 5.3 billion in 1985.

Mining machinery. Mining is of considerable significance in most of Latin America, contributing substantially to gross domestic product and foreign trade income. However, local production of machinery and equipment for the mining sector is almost insignificant in most countries, especially in Chile and in the Andean Pact countries. When produced, it is done mainly so by forging. Some are also cast products. The major demand for replacements is for off-road trucks (34 per cent). This type of transport equipment also accounts for 20 per cent of the demand for machinery and equipment for new projects. Other important machinery and equipment groups of this sector are excavating scrapers (22 per cent) and mills (16 per cent).

As to the share of the countries in the demand for mining machinery, Argentina accounts for 8 per cent, Brazil 26 per cent, Chile 41 per cent, Peru 24 per cent and Venezuela 1 per cent.

Machinery for sugar industry. There are 641 sugar factories installed in those countries which form the GEPLACEA (Group of Latin American and Caribbean sugar exporting countries).

The sugar-cane milling capacity each harvesting season is 356 million tons, and the capacity utilized in the second half of the 1970s was on the average 258 million tons, i.e. a 72 per cent rate of capacity utilization. If Brazil's capacity to produce alcohol is included, the utilized capacity increases to 311 million tons, or approximately 87 per cent of the total capacity.

In the decade of the 1970, sugar production rose moderately by 24 per cent from 21 million tons in 1970 to 26 million tons in 1979 and is expected to reach 32 million tons in 1985. The machinery and equipment installed in the sugar factories (not including equipment in or for the sugar field) was valued at $US 41.1 billion in 1980. Most of the installations are outdated and annual cost for spare parts, replacement and repair is estimated at $US 2.5 billion (6 per cent of the value of equipment). The investment required to increase production in the period 1981 to 1985 is calculated to be approximately $US 13.7 billion. Thus, total investments in the sugar industry are estimated to be $US 26 billion for the period 1981 to 1985, or $US 5.2 billion annually. This is considered to be the minimum investment required, not including any major technological change in production nor major renewal of installed equipment.

Even though the major portions of these investments will be in the form of special parts and equipment, there seems to be ample opportunity to promote specialized production units for such capital goods for the sugar industry. A plan for co-operation in maintenance and spare-parts production among the smaller sugarproducing countries might well improve the chances of such production.

As for investments in new installations, the average size sugar factory is between 6,000 and 8,000 tons per day of cane. A plant of 6,000 tons per day costs approximately $US 76 million, to which construction works, mechanical and electrical installations (40 per cent or $US 30.4 million) and engineering (10 per cent or $US 7.6 million) have to be added, thus giving a total of $US 114 million (1980 prices). The necessary equipment for the sugar fields is estimated at $US 7.9 million.

10.3 Strategies adopted for establishing capital goods industries in Latin America

10.3.1 The role of government

The achievements in industrial development stem among other things from the important role which the Latin American governments has attributed to

industry. These governments have been active in four aspects of industrial development:

Industrial policy. In the last three decades, the economic policies of many Latin American countries were in effect essentially industrial policies. Some examples of important aspects of these policies are: fiscal, exchange rate and credit policies; investment, promotion and support activities; and protectionism.

The interactions of state and industry, with or without direct interference by the state, are manifold. In the late seventies, especially in the countries in the southern part of the continent, the role of the state has been reduced considerably following the introduction of new economic policies. However, economic developments during the recession at the end of 1982 and the beginning of 1983 seem to indicate a new trend to return to the established policies of stimulating and guiding industrial development.

Public entrepreneurship. In general, the governments have limited themselves to the role of indirect agent in industrial investment and production. Yet almost every country has an exception whereby the state is owner of industrial enterprises. This is especially the case in basic industries, such as steel, petroleum and petrochemicals, important mining operations; and basic agro-industries, such as sugar production.

The governments have always limited their industrial activities to specific sectors and normally do not compete with private enterprises in the manufacturing sector. However, there are exceptions, for example when governments decide to take over financially weak companies to maintain existing employment opportunities.

State purchasing power. Through their activities as entrepreneurs the governments are direct purchasers of capital goods, e.g. for basic steel and petroleum industries. The second area of purchasing by the state is in sectors demanding capital goods, such as transportation (mainly railroad equipment), electricity generation and distribution, telecommunication and, in some cases, mining.

These direct purchases can represent in some countries up to 60 per cent of the total market for capital goods. Therefore, the purchasing policies of the governments can have an extremely strong influence on the performance of specific sectors of the capital goods industries. Thus, transnational corporations have participated to a large extent in the industrial opportunities created through such policies.

Intergovernmental co-operation through creation of regional markets. Parallel to industrial development and complementary to the national industrial policies, the governments of Latin America co-operate in the creation of larger sales markets through regional economic treaties.

The relative share of industrial output, especially in the metalworking sector, is still declining in most countries in Latin America. However, it is expected that towards the middle of this decade, the contribution of industry to the gross domestic product will increase again. The critical foreign exchange situation of the countries will most probably cause additional import-substitution efforts which will benefit local manufacturing of capital goods and contribute towards the creation of additional export incentives.

It is estimated by ECLAC that the degree of industrialization as indicated by manufacturing value added as a percentage of GDP in Latin America will increase to 34 per cent (37 per cent in the large countries, 28 per cent in the medium-sized countries and 26 per cent in the small countries), and that the share of the metal working industries in the industrial structure will amount to 31 per cent in 1990 and 39 per cent in 2000 (compared to 45 per cent in 1977 for the industrialized countries). This means a substantial industrial growth, especially in the production of capital goods. This will require close attention and particularly in the medium-sized and small Latin American countries elaborated strategies.

Possible future actions for development of capital goods in Latin America can be defined on national, regional or subregional levels. On the national level, they could be of the type already undertaken by UNIDO in the above-mentioned countries. On a regional or subregional level, they could

consist of regional meetings on means of strengthening the political and institutional framework, policy co-ordination and promoting industrial co-operation. For the sub-regions Central America and the Caribbean, a regional co-ordination project based on sectoral approaches to the local production and subregional exchange of capital goods must be undertaken. This co-ordinative effort would concentrate on complementation, subcontracting and specialization in sectors such as sugar industry equipment and spare parts, energy technology and food industry equipment.

10.3.2 Activities at the national level

The traditional instruments of import substitution will need a fundamental overhaul. In many cases, the existing legal and procedural bases are contrary to the local production of capital goods. For example, a newly created company might well receive import duty reductions for its machinery and equipment while a local producer of capital goods will not necessarily have the same benefits for imported steel raw materials. National financing institutions should more thoroughly consider the financing of locally supplied, instead of imported capital goods.

In some countries the existing laws on industry and promotion of industrial production might be sufficient to meet the requirements for the promotion of capital goods production, yet in some others this might not be the case. In each case a detailed analysis is advisable to reach the appropriate recommendations. As an example, UNIDO's technical assistance to various countries in the production of the capital goods industry can be mentioned (e.g. to Colombia, Ecuador, Guatemala, Mexico, Peru and Venezuela).

The analyses at national levels will most probably show that the institutional framework is not sufficiently developed to meet the requirements (at least this has been the case in the countries where those analyses have been carried out with the assistance of UNIDO). In particular institutional development likely will be needed in the following areas:

- Quality requirements;
- Technological information;

- Manpower training, also relating to rapid technological change;
- Growth conditions for the local capital goods industry;
- Intraregional co-operation and complementation;
- A co-ordinated national effort for dealing with all questions related to capital goods.

Past experience shows that the Latin American countries need a new approach to technology policies. The system of import substitution in many cases brought new production techniques requiring specific manpower skills to Latin America. Yet once this process of transfer and adaptation of technology had been achieved, enterprises did not see the need to further improve their technology since they were shielded from imports.

Continuous information treatment and supply mechanisms have not been established in the Latin American countries. Such a technology information system, consisting of a documentation centre and specific technology dissemination programmes is in many cases of high priority. It could also address aspects of transfer of technological know-how, such as licenses, to improve the negotiating power of the industry. An example of the implementation of such an information centre is in Venezuela, receiving technical assistance from UNIDO.

Large quantities of capital goods are purchased by government entities, either ministries, institutes or public enterprises. Thus, the government holds a considerable negotiating power which it can apply to stimulate the local capital goods sector. Yet in many cases this opportunity is not fully sized. Possible action for improving this situation include:

- Introduction of local purchase clauses;
- Improved information on government investment and purchasing plans;
- In the case of major investment projects, allowance for partial proposals;

- Incentives for the general contractor of a major investment project to solicit local supply;

- Elimination of so short delivery terms that local producers not selling from stock are unable to meet them.

10.3.3 Activities at the regional level

From a technological point of view, three forms of joint activities can be defined:

(a) Technological complementation, whereby two or more countries of the region agree on programming their capital goods industries in a co-ordinated manner. An example of such an effort is the metalworking industry programming in the Andean Pact countries.

(b) Specialization in selected fields of capital goods, e.g. construction of fishing boats in Peru. Additional areas could be mining equipment in the Andean Pact countries or spare parts and equipment for replacement in the member countries of GEPLACEA. For better efficiency, specialization and technological complementation should be considered jointly.

(c) Subcontracting where local industry joins a general contractor in the execution of a major investment project. The capital goods industry of the three large Latin American countries are in many cases already well suited to manage major contracts as general contractors.

For progress in regional co-operation in the capital goods industry, a set of political mechanisms will have to be determined in such a way that a concerted result will provide equal shares of benefits to the participating countries.

At the actual stage where regional co-operation and co-ordination are being conceived, a series of expert meetings seems appropriate to achieve the goals and to design the mechanisms and instruments. At the same time, the regional meetings will strengthen the different national official or private

institutions dealing in one way or another with capital goods. Presently, the different aspects of the capital goods sector are being handled by various national institutions which concentrate and specialize on specific subjects. The pursuit of this policy will lead to an improved and necessary coherence of objectives amongst institutions.

The present economically difficult situation of most Latin American countries makes it even more imperative to co-ordinate their development policies, especially industrial, commercial and financial policies. The scarcity of foreign exchange forces these countries to reduce their investment plans to the most needed projects and to look for new ways of industrial financing. A regional co-operational scheme on this topic might be of benefit for all parties involved.

Regional policy co-ordination will have to be combined and supported by actions on the national level, specifically in procedural matters and facilities available to the industries. Previous negative experiences, such as those of the Andean Pact (e.g. there was hardly any financial facility on the national level for investors planning to take up a production line in the framework of the metalworking programme) should serve as mementos in this context.

Based on national and regional demand and supply analyses, the different possibilities of local production of capital goods and possible forms of co-operation amongst industries on the enterprise level can be determined. The form of co-operation can be continuous as in the case of joint ventures, licensing or (reciprocal) representative agreements or project-based formations of a consortium or subcontracting agreements. In all cases, the need for preliminary planning and co-ordination during the execution of the project must not be underestimated.

For various sub-regions it is recommended to promote projects for widening the industrial co-operation among countries. Co-ordination based on sectoral approaches (e.g. sugar industry, energy technologies, food processing industries) can be expected to achieve positive results leading to sub-regional production and trade in capital goods.

10.3.4 Industrial financing

The financing of capital goods has developed parallel to the advancement, or lack of advancement of production in Latin America.

Most of the countries lack adequate financial promotion mechanisms to strengthen external sales of locally produced goods. Only eight of the Latin American countries have general systems for export financing and credit insurance. The case of Uruguay, where only an insurance system exists, can be considered unique. Bolivia, Ecuador and Uruguay have no specific financing mechanisms for local sales of capital goods. The eight countries with export financing for capital goods are the largest exporters of such goods in the region.

The credit terms for exports of capital goods can in general be considered as acceptable and in some cases in need of improvement. All countries apparently have credits available on the usual international terms and conditions. The exceptional case of Bolivia might result from the relatively little experience in exports and the small volume of its external sales of durable products. The credit systems in the different countries also seem to have the flexibility required for the exports of capital goods.

For the actual sales of capital goods, the financing possibilities for local sales are more important than the export facilities. The "compra-venta" (buy-sell) of capital goods used to be hampered in many Latin American countries by the lack of credit facilities, and in some countries this is still the case, e.g. Paraguay, whereas imported capital goods are financed either by the country of origin or through industrial investment credit lines in Latin America. In Brazil the credits for the purchase of machinery and equipment are given through FINAME (Fundo de Financiamiento para Aquisicao de Maquinas e Equipamentos Industrialis), the financing fund and equipment operating as a subsidiary of the National Economic Development Bank (BNDE). Mexico also has a credit line for import substitution of industrial equipment. Figures on the importance of financing for the development of local sales are not available.

10.3.5 Capital goods and national planning

Detailed development plans on a national level are not customary in Latin American countries. Many countries, such as Mexico, Guatemala and Honduras, do not elaborate national development plans, and in most cases the plans formulate only general objectives referring to major political issues like GDP growth, employment, productivity, trade balance improvement. More detailed plans might well exist on sectoral levels, including target figures and dates, such as oil production in Mexico or the sectoral industrial programming of the Andean Pact on petrochemicals, steelmaking, metalworking and automotive industries, or also on the degree of self-sufficiency in production in certain sectors of product groups.[52/]

The national development plans of selected Latin American countries underline that industrial policy mainly serves the purpose of creating a positive environment for private investment with only casual direct public intervention. Public activities, however, are more common in areas such as mixed industrial and governmental commissions in order to stimulate national production of capital goods.

10.4 The regional institutional framework

The regional institutional framework for the promotion of the Latin American capital goods sector centres around organizations such as the Andean Pact, ALADI (the successor to the Latin American Free Trade Area), the Central American Common Market and the Caribbean Community. Suffice it here to relate as an example the experience of the Andean Pact with its metal working industry programme. For more information, see the Latin American study.

For a further development of production in the metalworking sector, the individual national markets have been found too small to absorb additional investments in established enterprises or in new ones. The reduced market

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52/ Aspects of development plans of a number of countries as they relate to capital goods are presented in the regional study on capital goods in Latin America (UNIDO/IS.478).

size is also unfavourable to additional technological improvements which are specifically required so that an additional level of complexity in the production could be achieved.

The relatively quick implementation of new production in the first years of the Andean Pact programme led to its success. The programme and the decree on foreign technology have also increased the negotiating power of countries and entrepreneurs with transnational corporations. Transnational corporations have participated extensively in the establishment of additional production facilities, especially through know-how agreements. This is especially the case for production in the two less advanced countries Ecuador and Bolivia, which did not have their own technologies available to meet the requirement of their more advanced assignments.

Despite some success, there remain certain problems hindering improvement of the metalworking programme. They are considered to be:

(i) Non-stable membership; general lack of confidence by entrepreneurs in the future of the Andean Pact and lack of energetic control of governments on some unaccomplished items.

(ii) Lack of adequate administration of the programme on regional and national levels, especially for the pragmatic solution of procedural questions.

(iii) Lack of an aggressive promotional and adequate financial system on national and regional levels.

(iv) Shortfalls in implementation:

- Lack of complementary conventions between the member countries to reinforce the utilization of economies of scale;
- Time delays in the programme; the time for an in-depth analysis of a project was not available in many cases; the entry of Venezuela and exit of Chile contributed to the fact that additional time would be needed;

- The lack of a general concept to guide joint measures by the member countries led to an unsatisfying situation whereby only the concept of assignment served as the basis for decisions;
- Lack of specific measures on incentives and promotion beyond the creation of an amplified market;
- Lack of concurrent measures to improve the implementation capacity of the lesser developed countries, especially Bolivia.

(v) Insufficient action by member countries to implement the agreement, especially delays in signing Decision 57, obstacles in the internal liberalization programme and introduction of external tariffs.

(vi) Lack of enforcement of the provision of the agreement forbidding parallel establishment of production facilities for assignments made to other countries.

(vii) Lack of co-ordination of the programme with previous arrangements of some countries with LAFTA, so that some tariff measures could not be instituted in the manner planned by the programme.

(viii) Lack of an adequate industrial policy co-ordinated with and focussed on the sectoral programme. The countries continued their own industrial policy without adequately incorporating the programme.

11. THE ASIAN REGION

Asia has been undergoing a significant transformation in the last two decades. Twenty years ago, the average per capita GDP in the region covered by the Economic and Social Council for Asia and the Pacific was less than $US 145. Since then, the average per capita GDP of the region has increased considerably, reaching $US 261 in the late seventies. Over the years, this region attained an economic growth rate of 8.6 per cent, 6.7 per cent and 2.9 per cent in the industrial, service and agricultural sectors respectively.

The structure of employment in different sectors has also changed during the last two decades. The share of those employed in the agricultural sector to the total employed, fell from 74 per cent in 1960 to 60 per cent in 1978; the shares of those employed in industry and in the service sector increased from 8 to 13 per cent and 18 to 27 per cent, respectively.

Because of significant differences between the South-East and East Asian sub-region and the South Asian sub-region, the analysis of the capital goods industry must be carried out at these sub-regional levels.

11.1 South-East and East Asia

11.1.1 Global overview

The South-East and East Asian region covered by this section includes Burma, the area of Hong Kong, Indonesia, the Republic of Korea, Malaysia, the Philippines, Singapore and Thailand.[53/]

The capital goods industry in South-East and East Asia has developed very rapidly in the last 15 years and today the region produces a variety of capital goods ranging from electronic components to light aircrafts. In 1980, the exports of capital goods from the South-East and East Asian region were valued at more than $US 13,020 million. Furthermore there are indications

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53/ Data for Burma are generally not available so the study mainly covers the South-East and East Asian region with the exception of Burma.

that having exhausted the limits of import substitution in consumer goods, many of the countries and areas in South-East and East Asia are determined to develop their capital goods industry. Thus, the present decade may very well see further intensive developments in the capital goods industry in South-East and East Asia (see also the projected growth in chapter 7).

Table 16 shows the structure of manufacturing value added in three of the five capital goods industry categories in South-East and East Asia for selected years . The table shows that the percentage of manufacturing value added from the capital goods industries is highest in Singapore in all three sub-sectors. The Republic of Korea comes next, followed by Malaysia. The capital goods industry is least important in Indonesia where it contributes less than 5 per cent to total manufacturing value added. For the South-East and East Asian region as a whole (except Burma), the average contribution of the capital goods industry to total manufacturing value added is 18.6 per cent.

Singapore's dominant position in the capital goods industries in South-East and East Asia may be explained by its successful industrial policy that began after independence. Before that, the Singapore's economy was based mainly on entrepot trade. Following its independence in 1959, Singapore decided to idustrialize in an effort to solve its unemployment problem. Initially the Republic pursued a labour-intensive export-led industrialization strategy which was remarkably successful. The provision of fiscal incentives and development of infrastructure attracted numerous multinational corporations to establish offshore production sites in Singapore. Between 1967 and 1973, Singapore's real GDP grew at an annual rate of 13 per cent. Unemployment disappeared and by 1973, Singapore even had to import workers.

The world recession of 1974-1975 arrested Singapore's remarkable growth. When the economy recovered in 1976, the labour market had become so tight that the government decided to adopt a high wage policy to induce the manufacturing sector to shift from labour to capital- and technology-intensive industries. This move marked the beginning of Singapore's capital goods industry. Today Singapore produces various types of high technology capital goods ranging from automobile parts to computers. Faced with the rapid exhaustion of import

Table 16. Share of capital goods in total manufacturing value added, South-East and East Asia selected years, (percentage shares computed on dollar values at constant 1975 prices)

Country/ territory	Non-electrical machinery (ISIC 382)		Electrical machinery (ISIC 383)		Transport equipment (ISIC 384)		Capital goods industry (ISIC 382-384)	
	Year I*	Year II*	Year I*	Year II*	Year I*	Year II*	Year I*	Year II*
Hong Kong	1.81	2.59	10.77	10.89	4.13	2.95	16.71	16.43
Indonesia	1.24	0.65	2.28	2.85	3.15	1.44	6.67	4.94
Malaysia	2.49	3.09	6.04	12.00	1.06	2.52	9.59	17.61
Philippines	0.78	1.53	2.96	2.35	4.56	5.09	8.30	8.97
Korea	4.20	2.76	2.35	12.58	1.32	5.04	7.87	20.38
Singapore	5.33	8.73	3.68	28.28	7.41	16.21	16.42	53.22
Thailand	0.86	0.95	0.19	0.76	7.66	6.94	8.71	8.65
Weighted average	2.17	4.09	8.09	14.87	3.94	7.41	12.07	26.13

Note:

	Year I*	Year II*
Hong Kong	1973	1976
Indonesia	1975	1979
Malaysia	1968	1978
Philippines	1963	1977
Korea	1963	1979
Singapore	1967	1980
Thailand	1963	1975

(There are no data on Burma)

Source: UNIDO statistics.

substitution possibilities and the high level of unemployment in the late 1960s, the Malaysian Government decided to attract electronics industries to Malaysia. Fiscal incentives were offered and industrial estates developed to encourage the multinational electronics companies to locate their assembly subsidiaries in Malaysia.[54/] The strategy was a success and the Matsushita Electric Company became the first to set up an electronic factory in the country. The early electronics firms were mainly television set assemblers. Later on firms were set up to produce transistor radios. Initially, production was somewhat meagre in quantity, variety and value and was aimed at import substitution. Although production later increased significantly, the output was largely sold on the domestic market. In fact as late as 1972, Malaysia did not have even one export-oriented electronics company. Therefore, the Malaysian Government decided to intensify its campaign and declared electronics a priority industry. Free trade zones were developed and shortly thereafter, export-oriented electronics companies started operations in Malaysia. They produced a wide range of consumer products such as colour and monochrome television sets, transistor radios, electronic calculators and digital watches, telecommunication equipment and so forth. In addition, they also produced various electronic components such as transistors, diodes, integrated circuits, capacitors, transformers, silicon wafers, quartz crystals, etc. In 1980, Malaysia exported semi-conductors worth more than $US 435 million making the country the world's second largest exporter of semi-conductors to the United States.[55/]

Another product which helped to boost the substantial contribution to manufacturing value added in the electrical machinery industry in Malaysia was air-conditioners for export the country is now the third largest exporter of air-conditioners in the world.[56/] In 1980, the country exported more than 100,000 units of air-conditioners valued at more than $US 26 million.

54/ Peng Lim Chee, From Import Substitution to Export Promotion: A Study of Changes in Malaysia's Industrial Policy, in K. Yoneda, (ed.), Trade and Industrial Policies of Asian Countries, Institute of Developing Economies, Tokyo, pp. 41-98.

55/ Malaysia Industrial Digest, MIDA, September 1981.

56/ Malaysia Industrial Digest, MIDA, September 1981.

The contribution of the capital goods industries to total manufacturing value added in the Republic of Korea comes mainly from the electrical machinery industry. As in the case of Singapore and Malaysia the development of the electrical machinery industry in the Republic of Korea is also of relatively recent origin.

In the early 1970s, the Republic of Korea's planners felt that after a decade of successful promotion of labour-intensive manufacturers for export, the Republic of Korea's comparative advantage had shifted to skill- and technology-intensive products such as machinery, shipbuilding and sophisticated electronics. It was believed that a high growth objective could not be achieved with an industrial development strategy which emphasized the export promotion of labour-intensive manufactures during the first two plan periods (1962-1971). Moreover, since the Republic of Korea was bound to lose its comparative advantage in labour-intensive exports due largely to the rapid increase in Korean real wages and strong competition from other developing countries emulating export-led industrial growth, major shifts in production and exports in favour of the expansion of heavy and chemical industries were called for.[57/]

The new industrial development strategy was made public in 1973 and was pursued vigorously for the next seven years. During this time, investments in heavy and chemical industries grew at a rate unprecedented in the Republic of Korea, while the capital goods industry achieved a much lower growth rate.

A closer examination of other indicators shows that the new industrial policy encountered many problems.[58/] From the beginning, all sectors experienced a host of financing, production, and marketing difficulties. Foremost among them was the lack in demand, domestic as well as foreign, and resultant underutilized capacities in many industries; between 1975-80, the capacity utilization rate was less than 43 per cent in machinery and less than

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57/ Yungchul Park, South Korea's Experience with Industrial Adjustment in the 1970s, Asian Employment Working Paper, ARTEP, Bangkok, 1983.

58/ Yungchul Park, ibid.

36 per cent in transport equipment. Moreover, although the heavy and capital goods industries accounted for a significant increase in the Republic of Korea's GNP, they have not contributed significantly to export growth in recent years. In fact, beginning in the first year of the Fourth Five Yar Plan period, export growth fell sharply for 3 consecutive years, registering an absolute decline in 1979. The main causes of the Republic of Korea's restructuring problem was the establishment of inefficient and high cost industries which resulted in marketing problems. Nevertheless, there are some success stories in the Republic of Korea's capital goods industries, notably automobiles and shipbuilding.

Table 17 shows the value added of the capital goods industry in South-East and East Asia[59/] for selected years. The table shows that the Republic of Korea, Singapore and the area of Hong Kong accounted for 84.2 per cent of the total value added in the South-East and East Asia region.

The table also shows that with the exception of the Philippines and Indonesia, the electrical machinery industry accounts for the largest percentage of value added among the three sub-sectors in the capital goods industry. In the Philippines and Indonesia, the transport equipment industry accounts for the largest percentage of value added. In the Philippines, the importance of the transport equipment industry may be attributed to relatively high proportion of local content in the automobile assembly industry under the Progressive Car and Truck Manufacturing Programmes. In Indonesia the electrical machinery industry is relatively underdeveloped.

Table 18 shows the number of employees in the capital goods industry in South-East and East Asia for selected years. The table shows that the three countries or areas with the largest number of employees in the capital goods industry are, the Republic of Korea, the area of Hong Kong and Singapore.

The total number of employees in the capital goods industry in these countries total 72.4 per cent of the total number of workers employed in this industry in the South-East and East Asia region. The difference in the

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59/ Except Burma for which data are not available.

Table 17. Value added of the capital goods industry, South-East and East Asia, selected years ($US thousand of constant 1975 prices and per cent)

Country/ territory	Year	Non-electrical machinery (ISIC 382)		Electrical machinery (ISIC 383)		Transport equipment (ISIC 384)		Total	
		Value($'000)	%	Value($'000)	%	Value($'000)	%	Value($'000)	%
Hong Kong	1973	27,886	9.3	199,688	66.8	71,568	23.9	299,142	100.0
	1979	96,169	10.5	730,847	79.6	90,726	9.9	917,742	100.0
Indonesia	1975	19,352	17.2	44,055	39.3	48,851	43.5	112,258	100.0
	1979	41,280	16.9	92,160	37.9	109,920	45.2	243,360	100.0
Korea	1963	10,769	28.6	11,538	30.6	15,384	40.6	37,691	100.0
	1979	854,911	23.2	1,692,468	45.9	1,138,986	30.9	3,686,365	100.0
Malaysia	1968	8,187	39.1	6,534	31.2	6,207	29.7	20,908	100.0
	1978	66,991	17.4	247,191	64.5	69,576	18.1	383,318	100.0
Philippines	1968	6,394	8.4	31,458	41.4	38,107	50.2	75,959	100.0
	1977	26,191	13.9	80,194	42.7	81,544	43.4	187,929	100.0
Singapore	1967	4,574	21.9	5,227	25.0	11,107	53.1	20,908	100.0
	1980	348,131	19.4	946,729	52.9	495,327	27.7	1,790,187	100.0
Thailand	1963	1,793	18.9	2,072	21.8	5,619	59.3	9,484	100.0
	1975	20,236	5.3	217,859	56.6	146,808	38.1	385,003	100.0

Note: Data for Burma are not available.

Source: UNIDO data source.

Table 18. Number of employees in the capital goods industry, South-East and East Asia, selected years

Country/ territory	Year	Non-electrical machinery (ISIC 382)		Electrical machinery (ISIC 383)		Transport equipment (ISIC 384)		Total	
		No.	%	No.	%	No.	%	No.	%
Hong Kong	1973	11,700	11.6	72,000	71.2	17,400	17.2	101,100	100.0
	1979	13,600	9.4	117,700	80.9	14,100	9.7	145,400	100.0
Indonesia	1975	8,800	22.9	10,400	27.0	19,300	50.1	38,500	100.0
	1979	11,000	16.6	28,200	42.5	27,100	40.9	66,300	100.0
Korea	1963	13,600	31.8	10,000	23.4	19,200	44.8	42,800	100.0
	1979	96,900	20.9	248,400	53.5	119,300	25.6	464,600	100.0
Malaysia	1968	6,260	52.5	2,000	16.8	3,660	30.7	11,920	100.0
	1978	11,200	13.3	60,500	71.6	12,800	15.1	84,500	100.0
Philippines	1963	3,800	14.5	10,900	41.6	11,500	43.9	26,200	100.0
	1977	16,900	21.2	34,100	45.5	25,000	33.3	75,000	100.0
Singapore	1967	1,940	24.1	1,860	23.1	4,260	52.8	8,060	100.0
	1980	20,100	14.9	87,620	64.9	27,280	20.2	135,000	100.0
Thailand	1963	2,144	34.5	1,944	31.2	2,133	34.3	6,221	100.0
	1975	7,725	13.3	36,551	63.2	13,568	23.5	57,844	100.0

Note: Data for Burma are not available.

Source: UNIDO statistics.

percentages in value added (82.4 per cent) and employment (72.4 per cent) indicates the relatively high productivity of labour, possibly due to the relatively high capital intensity of the industry in the three leading producers.

Table 19 shows the value added per employee in the capital goods industry in South-East and East Asia for selected years. On the average, the value added per employee in the capital goods industry as a whole is highest in Singapore , followed by the Republic of Korea and the area of Hong Kong. The labour productivity in Singapore is nearly twice that in the Republic of Korea and more than twice as high as that in the rest of South-East and East Asia. Labour productivity in Singapore in each of the three sub-sectors of the capital goods industry is also highest compared to other countries or areas in the region. The relatively high labour productivity of the capital goods industry in Singapore results from the relatively high level of technology and capital intensity in the industry. A closer look shows that labour productivity is highest in the transport equipment industry in Singapore with a value added of $US 18,157 per employee.

The country with the lowest value added per employee in South-East and East Asia is the Philippines with only $US 2,420 or 13 per cent of Singapore's level. It is however interesting to note that in 1967, Singapore's labour productivity in the capital goods industry in 1967 was about half of that in the Philippines in 1963. But with rapid modernization and the introduction of high technology industries, the labour productivity in Singapore has now risen far above the Philippines' level.

Table 20 shows the mean size of establishments in the capital goods industry in South-East and East Asia for selected years. The mean size of establishment is largest in the electrical machinery industry. Country-wise the mean size is largest in Malaysia and smallest in the area of Hong Kong.

Finally table 21 shows the wage rate in the capital goods industry in South-East and East Asia for selected years. The table shows that the wage rate is highest in Singapore where the labour productivity is also highest. The country with the lowest wage rate is Indonesia where the wage rate is less

Table 19. Value added per employee in the capital goods industry South-East and East Asia, selected years

Country/ territory	Year	Non-electrical machinery (ISIC 382)	Electrical machinery (ISIC 383)	Transport equipment (ISIC 384)	Average $
Hong Kong	1973	2,383	2,773	4,113	3,090
	1979	7,071	6,209	6,434	6,571
Indonesia	1975	2,199	4,236	2,531	2,989
	1979	3,753	3,268	4,056	3,692
Korea	1963	792	1,154	801	916
	1979	8,823	6,813	9,547	8,394
Malaysia	1968	1,305	3,267	1,696	2,089
	1978	5,942	4,086	5,436	5,155
Philippines	1963	1,683	2,886	3,314	2,628
	1977	1,647	2,352	3,262	2,420
Singapore	1967	2,358	2,810	2,607	2,592
	1980	17,320	10,805	18,157	15,427
Thailand	1963	836	1,006	2,634	1,512
	1975	2,620	5,963	10,820	6,468

Note: Data for Burma are not available.

Source: UNIDO statistics.

Table 20. Mean size of establishment in the capital goods industry, South-East and East Asia, selected years (number if employees)

Country/ territory	Year	Non-electrical machinery (ISIC 382)	Electrical machinery (ISIC 383)	Transport equipment (ISIC 384)
Hong Kong	1973	8	91	100
	1979	9	63	46
Indonesia	1975	90	135	164
	1979	87	285	155
Korea	1963	17	34	22
	1979	55	159	127
Malaysia	1968	14	34	30
	1978	37	358	100
Philippines	1963	29	103	39
	1977	17	141	31
Singapore	1967	27	60	112
	1980	68	301	108
Thailand	1963	20	65	36
	1975	22	356	114

Note: Data for Burma are not available.

Source: UNIDO statistics.

Table 21. Wage rate in the capital goods industry South-East and East Asia, selected years

Country/ territory	Year	Non-electrical machinery (ISIC 382)	Electrical machinery (ISIC 383)	Transport equipment (ISIC 384)	Average $
Hong Kong	1973	1,400	1,519	2,757	1,892
	1979	3,780	2,883	4,904	3,856
Indonesia	1975	520	666	910	699
	1979	886	944	1,047	959
Korea	1963	339	308	441	363
	1979	3,554	2,576	3,921	3,350
Malaysia	1968	638	791	651	693
	1978	1,736	1,407	2,262	1,802
Philippines	1963	740	634	712	695
	1978	883	1,029	1,226	1,046
Singapore	1967	1,162	1,247	1,503	1,304
	1980	5,317	3,436	6,227	4,993
Thailand	1963	381	374	453	403
	1975	858	1,596	1,330	1,261

Note: Data for Burma are not available.

Source: UNIDO statistics.

than a fifth of that in Singapore. Singapore's wage rate in the capital goods industry rose nearly 4 times between 1967 and 1980. An even more remarkable increase may be seen in the Republic of Korea where the wage rate rose by a factor of 9.2 between 1963 and 1979.

South-East and East Asia imported capital goods valued at $US 3,262.8 million in 1970.[60/] By 1975 imports had increased to $US 10,526.9 million (or a 3.2 fold increase) and by 1980 capital goods valued at $US 29,137.8 million were imported by South-East and East Asia.

The three countries in South-East and East Asia which showed the greatest increase in their imports of capital goods between 1970 and 1980 were Singapore, Indonesia and Malaysia. Burma's increase in capital goods imports during the same period was the lowest.

Electrical machinery accounted for the largest share of total imports of capital goods in 1980 (40.3 per cent) followed by electrical machinery (35.5 per cent) and transport equipment (2.4 per cent). The proportions were not much different in 1970 except that transport equipment was slightly ahead of electrical machinery. The imports of non-electrical machinery steadily declined over the last decade while the reverse was true of electrical machinery.

By 1980, Singapore had replaced the Republic of Korea as the largest importer of capital goods in South-East and East Asia, with imports valued at $US 7,053.0 million or 2.42 per cent of South-East and East Asia's total imports of capital goods. The Republic of Korea which was next with imports valued at $US 4,974.7 million or 70.5 per cent of Singapore's imports.

South-East and East Asia exported capital goods valued at $US 13,020.6 million in 1980. Considering that South-East and East Asia imported capital goods valued at $US 29,137.8 million in the same year,

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60/ The trade figures for South-East and East Asia have to be discounted because important parts of the imports of Singapores and the area of Hong Kong are destined for re-export.

South-East and East Asia's imports were 2.2 times higher than its exports, resulting in a deficit of $US 16,117.2 million in the balance of trade in South-East and East Asia's capital goods. However, South-East and East Asia's exports have been growing much faster than its imports of capital goods. Thus in 1970, South-East and East Asia only exported $US 500 million worth of capital goods. By 1980, this had increased by to $US 13,020.6 million. Given past trends, the deficit in the balance of trade in South-East and East Asia's capital goods should be narrower by the end of this decade.

The three countries in South-East and East Asia that showed the greatest increase in their exports of capital goods between 1970 and 1980 were Thailand, the Philippines and the Republic of Korea. The rapid increase in Thailand and the Philippines may be explained by the small amount of exports from these two countries in 1970. Both countries exported less than $US 800,000 worth of capital goods each in 1970. The Republic of Korea too, had a relatively small export base in 1970. Still it would appear that all countries in the region, have made rapid strides in exporting capital goods over the last 10 years.

Singapore was the largest exporter of capital goods in South-East and East Asia in 1980 with exports valued at $US 5,105.5 million.[61/] The Republic of Korea was second with $US 3,432.3 million followed by Hong Kong with $US 2,392.3 million.[62/] However, in 1970, Hong Kong was at the top with exports valued at $US 240.0 million followed by Singapore ($US 170.1 million) and the Republic of Korea ($US 59.9 million). These three accounted for nearly 85 per cent of South-East and East Asia's total exports of capital goods in 1980. Singapore's advance to the top position was largely due to her exports of electrical machinery which almost doubled between 1970 and 1980.[63/]

61/ See footnote 13.

62/ Ibid.

63/ Ibid.

In terms of total value for the region as a whole, most of the South-East and East Asia's exports of capital goods went to North America, the ESCAP developing countries, and EEC. These three areas absorbed 78.4 per cent of South-East and East Asia's total exports of capital goods, with North America accounting for 36.9 per cent, ESCAP developing countries for 26.0 per cent and EEC for 15.5 per cent. South-East and East Asia's exports in terms of value to both North America and the ESCAP developing countries comprise mainly electrical machinery.

11.1.2 Strategies and further issues

The development of the capital goods industry in South-East and East Asia is a logical development of the industrialization process in many countries in the region. Having exhausted the import substitution possibilities in the manufacture of consumer goods in the 1960s, the more advanced South-East and East Asia countries and areas began to venture into the capital goods industry at the beginning of the last decade. The move was a great success especiallly for Singapore, the Republic of Korea and the area of Hong Kong. This prompted the other South-East and East Asia countries and areas to follow the same strategy. Although in many respects a success, certain problems will have to be overcome before the capital goods industry can develop to its full potential in South-East and East Asia.

One problem facing the capital goods industry in South-East and East Asia is, at times, a relatively low quality of the product. This has often been attributed to numerous factors, the most common ones being a desire to reduce costs and the lack of quality control. Other factors include the lack of standardization and inadequate resources devoted to research and development.

Capital goods manufacturers in the region are seriously affected by the shortage of highly skilled technical and engineering personnel. Producing capital goods requires a lot more skill than the production of consumer goods. But there is a general shortage of skilled labour in many South-East and East Asia countries, especially skilled metal tradesmen, maintenance tradesmen and mechanical engineers. Government sponsored training schemes are

often ineffective or inadequate to meet the demand for skilled workers. Many of the skilled workers presently working in the industry acquired their skill through on-the-job training, but this is limited by the amount of jobs available. Because of the shortage, wages for skilled workers are relatively high so some of the smaller manufacturers often do without these workers. For example, a study in Thailand stated that manufacturers of small tractors do not generally employ any engineers.64/

Some of the capital goods industries in South-East and East Asia are poorly integrated and have relatively few backward or forward linkages. A good example is the electronic components industry which has relatively few backward linkages due to the inadequacy in range, price and quality of the local ancillary firms.65/ Consequently manufacturers prefer to source most of their materials and components abroad resulting in relatively low value added in the electronic components industry.

Finally, a principal requirement for the efficient operation of a capital goods industry is the development of an extensive sub-contracting network. In the machinery sector of the advanced countries, sub-contracting has proved to be important in reducing costs. Small firms concentrating on a few operations or components common to a large number of producers are able to utilize special-purpose equipment fully, as well as obtain the benefits of learning over time as a result of specialization in a narrow area.66/ Sub-contracting also benefits the large firms. Japan's efficient motor vehicle industry relies heavily on its legendary Kanban ("just in time") system of ordering parts just in time for assembly, saving the manufacturers millions of dollars a year in inventory. The Kanban system cannot be

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64/ Agricultural Economics Section, Ministry of Agriculture, Small Tractor, Bangkok, Thailand, 1976.

65/ Eng Fong Pang and Linda Lim, The Electronics Industry in Singapore: Structure, Technology and Linkages, Economic Research Centre, University of Singapore, 1977.

66/ Howard Pack, "Fostering the Capital-Goods Sector in LDCs: A Survey of Evidence and Requirements", World Bank Staff Working Paper No. 376, Washington, D.C., 1980.

implemented unless there are efficient ancillary firms which can be relied on to supply high quality components with minimal rejection rates according to an agreed delivery schedule. Another prerequisite for the Kanban system is the close relationship between manufacturer and supplier. Both these prerequisites are lacking in South-East and East Asia.[67/]

11.1.3 Prospects and potential

Despite the problems plaguing the capital goods industry, there are excellent prospects for the further development of the industry in South-East and East Asia. This stems from three major factors. Firstly, the capital goods industry posted a relatively high rate of growth in South-East and East Asia in the last 20 years, especially in Singapore, the Republic of Korea and Malaysia (table 22)[68/] The electrical machinery industry recorded the highest growth rate among the three sub-sectors. There are strong indications that these growth rates will continue to prevail at least for the remainder of this century.

South-East and East Asia imported capital goods valued at nearly $US 30,000 million in 1980. With the acceleration in industrial development, which is a major objective in many South-East and East Asian countries, the demand of capital goods is likely to intensify. Thus there is still a significant scope for import substitution of machinery and transport equipment. Also the South-East and East Asian region appears to have a comparative advantage in the production of certain types of capital goods. These are mainly electrical machinery which presently accounts for more than 65 per cent of South-East and East Asia's exports of capital goods. Among the electrical machinery, the factor endowments of South-East and East Asia are ideally suited for the production of electronic components, radios, batteries,

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67/ K. Odaka, The Motor Vehicle Industry in Asia, Singapore University Press, Singapore, 1983.

68/ The relatively high growth rate in Thailand may be due to the fact that the data for Thailand go back at least 5 years earlier than most of the other countries.

Table 22. Estimated growth rates of capital goods industry in South-East and East Asia, 1963-1980 (per cent)

Country/ territory	Non-electrical machinery	Electrical machinery	Transport equipment	Weighted average for all sub-sectors
Hong Kong	22.9	24.1	4.0	20.5
Indonesia	20.9	20.3	22.5	21.3
Korea	31.4	36.6	30.9	33.2
Malaysia	23.3	43.8	27.3	33.8
Philippines	17.0	11.0	8.8	10.6
Singapore	39.5	49.2	33.9	40.8
Thailand	23.4	47.4	31.2	36.2
All countries (average)	25.5	33.2	22.7	28.1

Source: UNIDO statistics.

electrical switch gears and television sets. Each of these products figure prominently in the export composition of South-East and East Asia's capital goods. Electrical machinery products generally have a high income elasticity of demand, so rising income in the region should stimulate the domestic demand for these products.

However, the best prospects for the electrical machinery industry in South-East and East Asia will lie in the extension of backward and forward linkages, particularly in the electronic components industry. As stated earlier, the industry is poorly integrated and there are few linkages with local industries. Most of the materials for the components are imported and the assembled components are subsequently exported. There are signs that transnational corporations are considering the possibility of increasing linkages in the industry. Manufacturing plants are being planned in the region to produce electronic products ranging from colour television sets to personal computers which will use some of the electronic components products in the South-East and East Asian region. All these plans should boost the value added in the electrical machinery industry in South-East and East Asia by the end of this decade.

Another capital goods industry which has good prospects for further development in South-East and East Asia is non-electrical machinery. In 1970, this industry contributed 20.3 per cent to the total value of capital goods exports from South-East and East Asia but in 1980 the proportion dropped to 16.8 per cent. In terms of absolute value, however, exports of this product increased 22-fold during the last decade. There is potential for further development, especially pumps, heating and cooling machinery, calculating machinery and agricultural machinery. More than half of the countries in South-East and East Asia have a large agricultural sector where mechanization is still at a relatively low level. The need to step up the pace of mechnization and modernize the agricultural sector should stimulate the demand for agricultural machinery. Malaysia for example faces a shortage of labour in its rubber and oil palm estates. The possible but difficult solution is increased mechanization. Even without labour shortage, the increased use of agricultural machinery is required to increase productivity in the agricultural sector.

Locally produced machinery is often more suitable for South-East and East Asia because their design is simpler and more appropriate to the needs of local farmers. It is also cheaper and can be serviced by the manufacturers and parts are readily available. There are numerous examples of local ingenuity which have been applied to the development of simple and yet effective machinery for local use.

There has also been a significant transfer of technology in the machinery industry. Most of the technology was acquired either by workers working in machinery manufacturing plants or repairmen repairing or servicing various types of machinery.

Various types of agricultural processing machinery also have good prospects for development. Some of the countries in South-East and East Asia such as Malaysia and Indonesia are the world's leading producers of various primary commodities such as natural rubber and palm oil. Malaysia is already the world's largest exporter of rubber and palm oil processing machinery. The expertise in the manufacture of these machines can be readily extended into other crops such as rice and cocoa. As the production of these crops increase the demand for processing machinery will develop.

The South-East and East Asian countries have a potential for production of automobile components, some of which they are already exporting. Another possibility lies in bicycles which are extensively used in South-East and East Asia. But strangely enough very few South-East and East Asian countries produce their own bicycles. Instead these countries tend to assemble bicycles mostly from imported components. Yet another possibility is small ships and boats especially those made of fibre-glass. At present the market for pleasure fibre-glass boats, is dominated by Taiwan Province of China but many South-East and East Asian countries have the technology and capability to enter the market. Moreover, fibre-glass technology applied to boat-making is a labour intensive sort of shipbuilding.

Further developments in the capital goods industry in South-East and East Asia will have to overcome several major problems. In this respect the decision to develop the motor vehicle industry by several countries in

South-East and East Asia is a cause for concern. Secondly, the capital goods industry in South-East and East Asia still turns out a large proportion of low quality products in an effort to compete on price. Thirdly, the industry faces a shortage of skilled workers in several countries. Fourthly, some of the capital goods industries in South-East and East Asia, especially the electronics industry, are poorly integrated and have relatively few backward and forward linkages. Finally, the capital goods industry in South-East and East Asia is poorly supported by a weak network of sub-contracting firms.

11.1.4 Conclusions and recommendations

Proper planning is necessary in developing the capital goods industry. The right type of industries to develop is critical and the choice should, as far as possible, be based on comparative advantage. Countries which are planning to develop their automobile industry should be clearly warned about the possible pitfalls of going into this industry. In this connection, greater awareness about the problems of the automobile industry in such countries as the Republic of Korea and Australia may make it easier for policy-makers to analyze the potential drawbacks of developing a high cost industry to serve a small-scale market. If countries decide to pursue development of a motor vehicle industry, then a regional approach may be preferable. The ASEAN Automobile Complementation Scheme provides a good basis for this type of regional co-operation and should be revived.

Thirdly, planning the development of the capital goods industry should incorporate plans for ancillary firm development which can form part of the overall promotional package for small industry development. Governments should consider measures for stimulating and assisting the development of ancillary firms for targetted industries. Measures should also be taken to foster closer relations between manufacturers and supporting industries. Developing a sound supporting industry to supply inputs will help to improve the competitiveness of many capital goods industries, especially in the electronics industry. In these industries materials and not wages form the bulk of manufacturing costs. The local availability of material inputs is an important reason for the competitiveness of the industry in the area of Hong Kong despite high wages.

Fourthly, measures should also be taken to encourage firms to improve the quality of their products. One of these measures will have to consider ways of increasing the supply of skilled workers for the capital goods industry.

Finally, incentives should be devised to encourage selected capital goods industries such as electronics to foster greater backward and forward linkages so as to increase the manufacturing value added in these industries.

11.2 South Asia[69/]

Almost all the countries covered in this section are primarily agriculture based. Measured at 1975 prices, the contribution of agriculture to GDP in these nations varied from 10 per cent in the case of Iran to as high as 62 per cent in the case of Nepal in 1978. The industrial sector's average contribution to GDP in the same year was around 22 per cent in all the countries except Iran where it was as high as 54 per cent, due mainly to petroleum production.

Growth rates of GDP and the manufacturing sector during the period 1970-1980 for the countries in the region are presented in table 23. Compared to the previous period 1960-70, the manufacturing growth rates recorded by most of the South Asian countries fell. Though the reasons for decline in the growth rates are different for each country, in most cases the common factors are increased oil prices and hence balance of payment difficulties, growing populations and a variety of domestic constraints.

The share of manufacturing in GDP for the countries in the region is presented in table 24. In the case of Sri Lanka since 1975, there is a sharp decline in the relative output of the manufacturing sub-sector. Thus, a large portion of Sri Lanka's income is derived from the cultivation, processing and export of agricultural commodities - tea, rubber and coconuts. However, on

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69/ Afghanistan, Bangladesh, India, Iran, Pakistan and Sri Lanka are covered in this section, which is based on a document presently under elaboration for a forthcoming ESCAP/UNIDO workshop, to be held in July 1985.

Table 23. Annual real growth rate of GDP and manufacturing, 1970-1980 (per cent)

Country	Per cent growth in GDP[a/]	Per cent growth in manufacturing
Afghanistan	2.6	2.9
Bangladesh	3.7	8.5
India	3.1	4.4
Iran	4.7	9.4
Nepal (1979-80)	...	6.7
Pakistan	5.9	4.9
Sri Lanka	4.6	3.0

a/ At 1975 factor values.

Source: Handbook of World Development Statistics, 1983, United Nations, New York. April 1984.

Table 24. Manufacturing as per cent of GDP 1973-1981
(per cent)

Country	1973	1974	1975	1976	1977	1978	1979	1980	1981
Afghanistan*/	9.8	10.1	10.5	10.2	11.2	11.4	11.0	10.7	10.1
Bangladesh	6.0	6.7	7.6	8.2	7.2	7.1	7.3	7.7	7.7
India	14.1	15.6	15.6	16.1	15.9	17.0	17.9	17.2	17.3
Iran	10.4	7.7	8.5	7.6	8.0	8.0	7.9	7.3	6.7
Nepal	3.6	4.1	4.0	4.1	4.5	4.3	4.1	4.2	3.7
Pakistan	15.9	16.7	16.5	16.4	16.0	15.7	16.5	16.9	16.6
Sri Lanka	17.4	18.6	27.9	20.1	23.1	20.0	19.1	17.7	16.2

Source: Handbook of World Development Statistics, 1983, United Nations, New York 1984.

average, about 50 per cent of Sri Lanka's manufacturing output is derived from agro-based industries such as beverages, tobacco, food products, textiles, etc. The decline in the share of manufacturing was accompanied by a steady increase in the share of construction and electricity, gas and water.

In almost all the countries, agro-based industries such as textiles, food products and tobacco were the major contributors to the manufacturing value added. In the case of Iran, petroleum products accounted for almost 50 per cent of the value added by manufacturing.

The region is dependent on imports for the bulk of its capital goods requirements. The imports of non-electrical, electrical, and transport equipment of each country are shown in table 25.

Average per capita GDP in South Asia was $US 189 with a maximum of $US 1,102 in Iran and a minimum of $US 103 in Afghanistan in 1980, measured in 1975 dollars. The low income is mainly due to the limited size of the industrial sector compared to agriculture.

Agro-based economies, which are prevalent in most of the countries in South Asia, can realize many benefits from the judicious use of capital goods. Tractors, harvesters, threshers, etc. can increase productivity (yield/person-year-hectare). Productivity can also be increased by adopting mechanical means of irrigation and biochemical technology comprising fertilizers and high-yield seeds. Post-harvest technology is another field which can benefit by employing capital goods in erection of cold storages, storage silos and in providing packaging materials.

Capital goods like wood cutting machinery, dairy plants, fishing equipment and handlooms can provide many other avenues of income and useful employment in the rural sector.

Exploitation of known natural resources - new mineral and energy resources such as coal, gas, petroleum, etc. - needs varied types of earthmoving machinery and drilling rigs.

Table 25. Imports of non-electrical, electrical, and transport equipment, selected years (US $ thousand)

Country	Year of reference	Non-electrical machinery	Electrical machinery	Transport equipment	Machinery and transport equipment
Afghanistan	1977	9,210	14,915	28,553	52,679
Bangladesh	1979	192,468	90,684	89,205	372,357
India	1979	861,598	288,789	312,852	1,463,240
Iran	1977	3,549,204	1,432,498	1,411,944	6,393,646
Nepal	1980	24,244	21,869	26,686	72,798
Pakistan	1980	575,429	177,450	604,931	1,357,811
Sri Lanka	1980	226,454	95,002	185,052	506,509

Source: Asian Industry in Figures, UNIDO/IS.390 dated 15 June 1983.

India is the largest country in the South Asian region and is comparatively more industrially developed than the other members of the region. Still if it were to achieve a modest per capita income of $US 300 at the end of the current century - a level already reached by several other developing countries today - it needs a substantial increase in production by the manufacturing sector.

The agriculture sector in the South Asian region needs substantial help from the industrial sector. At present, productivity of both land and labour is low. Against an average world production of 1,914 kg of wheat per hectare in 1981, the Indian yield was only 1,649 kg. In the case of rice, the Indian yield per hectare was 2,010 kg against Japan's 5,629 kg and China's 4,627 kg. The productivity of other countries in the region is no better. This situation can be improved by switching from traditional methods of farming to mechanical farming and increased use of fertilizers and pesticides.

Manufacturing non-electrical machinery, electrical machinery and transport equipment requires basic industrial necessities, such as machine tools. However, the consumption (let alone the production) of machine tools is low in the region. Compared to the more advanced countries like the United States and the USSR where annual consumption of machine tools is about $US 2 billion each, India's consumption works out to $US 360 million i.e. hardly 17.5 per cent of the United States or USSR.

As the majority of South Asian consumers have low incomes, the manufacturing establishments often are small and cannot reap the full benefits of the economies of scale. This situation could be improved upon by pooling the home markets of countries in the region. Till today there are no such arrangements existing in the South Asian region, unlike among the ASEAN countries.

Steel is the single largest raw material required by the capital goods industry. Its production in 1981 in the South Asian region amounted to about 11 million tons. Out of this, India's share was about 10 million tons while Iran and Pakistan together contributed little over 1 million tons. In 1981,

the total consumption of steel in the region was approximately 18 million tons. While India imports only alloy and special steels, other countries in the region depend mostly on foreign sources for all categories of steel.

The cost of machine tools and other equipment, inclusive of material handling and utilities, varies from 50 to 60 per cent of the total project costs for a capital goods manufacturing industry in the developing countries. If there are no local sources of supply, the entire equipment need to be imported, thus placing a heavy burden on the countries' foreign exchange reserves.

Among the South Asian countries, India is the largest manufacturer of machine tools. Machine tools are also manufactured by Iran and Pakistan in limited quantities. India manufactures a wide range of metal working, metal forming and other metal cutting machines such as boring machines, lathes, drilling machines, presses, etc. Other machine tools and accessories made in India include welding and plastic machinery, die casting machinery, small cutting tools, testing and measuring instruments. India is not only self-sufficient in general purpose machine tools but also exports them to several developed and developing countries. The exports of Indian machine tools in 1982 were valued at $US 24 million.

In recent years, India has widened its range of manufacture to cover many sophisticated machines like N.C. lathes, hydro-copying lathes, N.C. ram type milling machines, gear hobbing and cutting machines, internal and special purpose grinding machines, thread rolling machines, etc.

Special purpose machine tools imported by India include jig boring machines, precision gear grinding machines, spiral bevel gear cutting machines and slide-way grinding machines. Due to limited demand for these machines in the country, economically viable units could not be set up to manufacture them.

Recent experience in India has shown that even workers who are quite unfamiliar with machine technology can acquire reasonable proficiency at repetitive tasks in a mechanized factory within a not unduly long period of training and practice. There is usually no great difficulty in finding

workers to be trained within the plant to perform more intricate tasks requiring a greater degree of judgement. The main difficulty lies at the higher levels in the factory hierarchy - foremen, plant supervisors, technicians, skilled mechanics and welders, maintenance engineers, material engineers, designers, research workers, production and programme engineers, work managers and the various executive and administrative decision-making personnel normally responsible for organizing and maintaining smooth production operations. Faulty production planning, poor choice of materials, incorrect assignment of machines, lack of balance between parallel movements of components or semi-finished materials, inadequate maintenance of plant and equipment, bad industrial relations and ineffective management are weaknesses, all of which reduce productivity and raise unit costs. Almost all these drawbacks result from shortages of well trained personnel in their respective fields.

Though manufacturing and design technologies can be borrowed, imported technologies need certain modifications to suit the local inputs and environments. For this an infrastructure in the shape of consultancy, design engineering, erection and commissioning expertise, and research and development facilities should be built up. India has gone a long way in building up such facilities and could be of help to other members of the region. In fact, the so-called intermediate technology as developed by Indian expertise, should be more suitable in the region because of similar background, resources and environments.

Though the region as a whole has made good progress in power generation, there are still some pockets with power shortage. Due to this, some of the high power consuming units are virtually forced to install captive power generation sets. In addition to increasing the project cost by 10 to 15 per cent this also adds to running costs as the cost of captive generation is two to three times the public tariff.

Co-operation in the field of industrialization has not been significant in South Asia. India has the widest co-operation with other countries. It has absorbed foreign technologies and also modified them to suit its own environment. Along with the exports of various capital goods, it is exporting

its technical consultancy services to other developing countries in the Middle East, South East Asia and Africa. In the year 1982-83, its exports of engineering goods reached a level of 12,500 million Rupees. By April 1983, it had set up about 233 joint-ventures in 36 developing and developed countries. Of these South Asia's share of 31 is far less compared to South-East Asia's 89, Africa's 47, Europe and America's 38 and 25 in West Asia.

One possibility for international co-operation might be to set up capital goods industries as joint-ventures and the sharing of the product and employment opportunities. Machine tools and equipment for the joint-ventures could preferably be procured from regional sources. Transport equipment like buses, trucks, cars, railways' rolling stock need high volume production and thus offer a unique opportunity for such joint-ventures. Increasing facilities and agreements for bilateral and multilateral trade and pooling of markets in general and in capital goods in particular would also be important steps in laying the foundation of co-operation in development of this industry.

12. WEST ASIA AND NORTH AFRICA[70/]

12.1 Global overview

The region, despite its vast resources and its huge size is a collection of fragmented markets with little economic interrelations among its parts. Capital goods production is dependent on external and internal scale economies and it is not surprising to find that only a few capital goods are produced in the region and primarily only in a few countries.[71/] Hence, unless the local markets are aggregated together at least on the basis of subregional associations, they will not provide sufficient stimulus for the production of this type of complex and scale sensitive products.

Much of what is produced is simple, small and is produced on a limited scale. Gross output data of the capital goods sector are misleading in most of the region as they generally include repair services of machines. This results in an over-stated level of output of this sector and more overstatement of employment in this sector.

Egypt, which is itself a large market, is the region's major producer of capital goods. More than 754.3 thousand workers were employed in this sector in 1976 and it produced over $US 2.2 billion of value added in 1975. But even in Egypt the range of capital goods produced is narrow and restricted to simple products. When complex products such as cars, tractors, generators, etc., are produced, the local contribution is rather minimal often involving only simple assembly operations.

Table 26 shows that there is a clear correlation between the value of imports of capital goods and industrial production as a whole in the region. However, caution should be exercised in interpreting the results in that

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70/ This region comprises the Arab countries in West Asia and North Africa.

71/ UNIDO/IS.421 and UNIDO/IS.451, op.cit.

Table 26. Value of industrial production (1980) and of imports of capital goods (1979) for selected countries

Countries	Industrial production 1980 a/* billion	Imports of capital goods (except transport equipment)** 1979 billion
Saudi Arabia	90,035	7,717
Iraq	26,140	3,818
Libyan Arab Jamahiriya	23,104	2,636
Algeria	22,725	2,720
Kuwait	21,600	1,415
Egypt	8,040	2,447
Morocco	5,740	726
Syrian Arab Republic	3,483	807
Tunisia	2,555	637
Sudan	1,000	260
Jordan	700	360
Yemen Arab Republic	417	na
Somalia	124	na
Mauritania	161	na

a/ Manufacturing, mining, construction, electricity, water and gas.

* Source: World Development Report, 1982.

** Source: Bulletin of Statistics on World Trade in Engineering Products, 1980.

oil-related industrial production plays a dominant role in a number of these countries, and it is difficult, in relation to demand for capital goods, to separate the income effects from the industrial development effects of industrial production levels using this set of data.

The region's trade in capital goods grew very rapidly in the 1970s. Imports grew by a factor of 14.3 and exports by a factor of 14.8 over this period. The growth in inter-regional trade was also very rapid (11.6 times).

In 1979 the region imported over $US 39.8 billion of capital goods. The largest imports of capital goods were in non-electrical machinery (SITC 71), where 1979 imports were $US 14.1 billion, followed by transport equipment (SITC 73), where imports were $US 10.8 billion, and electrical machinery, apparatus, and appliances (SITC 72) which accounted for $US 9.3 billion.

Capital goods for basic industries is the largest import category representing 30 to 50 per cent of capital goods imports in 1980, depending upon the country. Capital goods common to all branches (office machines, heating and cooling equipment pumps, mechanical handling) represent the second most important category (25 to 30 per cent), followed by capital goods for infrastructure (10 to 14 per cent). Capital goods for consumer goods rank fourth usually; however one can find some country differences such as the Libyan Arab Jamahiriya and Saudi Arabia (where the share is small) and countries such as Morocco and Sudan where this category represents 20 to 25 per cent of total capital goods imports.

Finally, capital goods for agriculture (5 to 10 per cent) and capital goods for capital goods (1 to 5 per cent) represent smaller shares in imports.

A growing differentiation between oil surplus countries and other countries in the region exists in that the former's imports emphasize basic industries while the others import more capital goods for consumer goods industries. On the other hand a growing uniformity is evident for such categories as capital goods common to all branches which account for 25 to 30 per cent of total imports in 1980 - the differences in import share for the countries were larger in 1970; capital goods for infrastructure which account for 10 to 14 per cent of total imports; and capital goods for agriculture and for capital goods - these imports have tended towards 5 per cent and 2 per cent respectively.

With respect to the demand structure, one can consider three types of countries in the region:

(a) rural countries where emphasis is put on agriculture and consumer goods industries (e.g. Sudan's import share of capital goods for agriculture and for consumer goods which ranks the highest in the region);

(b) oil-exporting countries which put emphasis on industrial development (for example, in Algeria capital goods for basic industry imports constitute about 45 per cent of total capital goods imports and the share of machine tools imports ranks highest (3.6 to 3.7 per cent); the import share of capital goods for consumer goods industries is around 10 per cent);

(c) oil-exporting countries such as Saudi Arabia and the Libyan Arab Jamahiriya, where the main emphasis is on basic industries (capital goods for consumer goods industries represent only 2 to 3 per cent of these countries' total capital goods imports).

The share of capital goods within total imports has been increasing significantly in the region due to the in rapid industrialization and to the simultaneous stagnation of the domestic production of machinery. By 1979 this share reached 45 per cent as against 34 per cent back in 1970, larger than among any other major configuration of countries.

The trends in imports of capital goods differ from those of the world and developing countries in two respects. The share of transport equipment in total regional imports has slightly dropped, while world-wide trade, including developing countries, showed a modest rise. This is all the more interesting because in 1979 the share of transportation equipment was already 33.2 per cent in the world trade of capital goods, while for the region it was no more than 27 per cent. But manufactures of metals registered a three-point increase in the region's imports (from 10 to 13 per cent), while the share of this commodity group had not changed in other regions' imports. This happened in spite of the fact that the share of this commodity group was already larger in the West Asian - North African region than the world-wide average (7.2 per cent in the world trade and 8.8 per cent in the developing countries).

The largest production (in terms of value added) of capital goods in the region is in the manufacture of electrical machinery, apparatus, appliances, and supplies (ISIC 383), followed by fabricated metal products except machinery and equipment (ISIC 381), transport equipment (ISIC 384), non-electrical machinery (ISIC 382) and manufacture of scientific, control, professional and measuring equipment (ISIC 385). Thus no high rank correlation of subsectors in trade and production is observed.

The largest importer of capital goods by far was Saudi Arabia, which imported the vast majority of its capital goods from the developed market economies. The second largest importer in all the six major SITC groupings was Iraq. Exports of capital goods to the countries of the region (almost

$US 40 billion in 1979) show a relatively stable pattern in terms of type of capital goods, but much greater variability in terms of geographical origin. Most of the region's imports of capital goods (62 per cent) came from European countries, followed by East Asian countries and North American countries. Only in 1979 have East Asian exports outstripped North American exports.

Exports of capital goods to the region grew rapidly in the 1970-1977 period but exhibited a marked levelling off in growth after that.

The overall picture that emerges is one of rapidly expanding imports of capital goods, concentrating on trade with developed market economies and inter-regional trade. Although exports too, grew rapidly (slightly faster than imports), they still represented only a very small share of the region's trade in capital goods.

Forty per cent of the region's total exports were to other countries of the region. The rate of growth of exports to other countries was, however, faster than the rate of growth of inter-regional trade. The fastest growing inter-regional export item was manufacture of metals, SITC 69 ($US 116.7 million in 1979), while the absolute largest item remains transport equipment, SITC 73 ($US 313. million in 1979). Globally, the largest and fastest growing capital goods export was transport equipment ($US 931.9 million in 1979). Forty-three per cent of all these exports of capital goods were realized by Saudi Arabia, first and foremost to developed market economies.

It is interesting to note that in 1975 (the last year for which production data were available) Saudi Arabian value added was reported to be $US 33 million, concentrated in the manufacture of metals (SITC 69). In that same year Saudi Arabia's exports of SITC 69 amounted to $US 1.59 million and total exports of capital goods amounted $US 68.6 million. This points to the probability of major re-exporting of capital goods from Saudi Arabia. This sort of analysis leads to the same conjecture about re-exporting from Syrian Arab Republic, Lebanon, Kuwait, Jordan, Bahrain, the Yemens, Somalia and Mauritania. This pattern evidently needs closer analysis. The use of trade/production ventures with very low value added set up ostensibly as

manufacturing establishments to benefit from the special status of such establishments; tax, duty and transfer-pricing considerations; and the international movement of construction equipment at the end of construction projects could provide possible explanations of the re-exporting phenomenon.

Inter-regional trade in capital goods represented only 1.7 per cent of total imports and its share fell over the decade (from 2.1 per cent in 1970). The share of inter-regional exports in total exports also dropped over the decade (from 50.8 per cent in 1970 to 39.9 per cent in 1979). The largest inter-regional exporter of capital goods was Saudi Arabia ($US 280.6 million) and the largest importer of capital goods from other countries of the region (mostly Saudi Arabia) was the Yemen Arab Republic ($US 161.8 million in 1979).

12.2 Future demand for capital goods in the region

UNIDO has made detailed conditional econometric forecasts for the demand for capital goods for individual countries in the region.[72/]

Briefly, the approach was as follows. A set of hypotheses about demand relationships for capital goods were drawn up and tested empirically. The assignment of specific capital goods to sectors employed engineering and other technical data, whereas the set of explanatory variables chosen, their signs and the structure of the equation were modelled along the a priori restrictions of economic theory.

Two basic premises were then used to create conditional forecasts. The first pertains to the structure of the economy and the second pertains to its capacity for growth. Structure was reflected through the sectoral shares. Here the share of manufacturing played the major role. Two basic alternatives

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72/ For a detailed description of methodology and results see Arab Demand for Capital Goods in the Short, Medium-and Long-Term, UNIDO/IS.451, op.cit. These projections are conceptually different from those presented for the West Asian and North African regions presented in Chapter 7 above in that the latter project regional production rather than demand. They could, of course, be combined in a gap analysis to identify production possibilities.

were entertained; the first emphasized the historical trend ("T" for "trend"), whereas the second was rooted in the aspirations and the plans of the country under study ("O" for "off-trend" .

The second premises, the capacity of the economy to grow, was captured by the rate of growth of GDP. Two distinguishing features were emphasized. First, the oil producing countries were treated as a special group whose GDP growth was related primarily to the developments in the international and domestic oil industry. Second, non-oil producers' GDP growth rates were designated high or low in relation to their position with regard to their historical growth rates. Depending on the situation, a high growth (H) or low growth (L) was specified in the forecasts. Thus there were basically four forecasts, high off-trend (HO), high trend (HT), low off-trend (LO) and low trend (LT). The HO forecast thus represents the highest and the LT forecast the lowest forecast demand.

The forecasts were first generated in current dollars and then deflated to represent constant 1980 United States dollar values. Below only the constant dollar values are discussed.

12.2.1 The medium-term forecasts (1990)

The regional demand for capital goods is forecast to reach a high (HO) of $US 89.2 billion in 1990 in constant 1980 prices. Even the low forecast (LT) is a significant $US 68.1 billion. There is a marked and growing difference between the trend and the off-trend forecasts of demand for capital goods in 1990. This difference is slated to reach over $US 21.1 billion in 1990. In percentage terms, the difference in 1985 is expected to be only 18.4 per cent of the lower forecast, whereas it is expected to exceed 30 per cent in 1990.

The forecast demand for non-electrical machinery will exceed the expected demand for transport equipment[73/] and the magnitude of dominance of the former over the latter is significantly larger under the off-trend alternatives than under the projected trends of sectoral shares.

73/ It is interesting to note that the reverse is true for the projected production.

At the product level, power generating machinery, special industrial machinery, construction and mining machinery, other special machinery, pumps and centrifuges, mechanical handling equipment, electrical power machinery, power transforming machinery, telecommunication apparatus, buses, trucks and lorries, and manufactures of metals dominate the expected structure of demand for capital goods in the medium-term.

As expected, the regional distribution of demand highlights the dominant share of oil producing countries in total regional demand for capital goods in 1990. The oil producing countries are forecast to account for over 85 per cent of the total demand for capital goods in 1990 (HO alternative). This share is slightly higher than that which is likely to prevail in 1985.

The oil producing states also have a different demand structure for capital goods than the non-oil states. Agricultural machinery constitutes a major component of the non-oil states demand for non-electrical machinery. The same product is only a relatively small fraction of the oil producers' total demand for capital goods, particularly in the medium-term. Demand for other special machinery in the oil producing states is a major item; its relative importance in non-oil states falls far below its corresponding share it accounts for in the oil producing states.

The member countries of the Gulf Co-operation Council (GCC) are expected to account for the major share of the region's demand for capital goods. The forecast demand for this region is $US 46.6 billion in 1990, or about 52.2 per cent of the corresponding total (HO hypothesis). There appears to be a tendency for GCC to increase its total share in the regional total given that it is estimated to represent 50.6 per cent in 1985 under the same set of assumptions. A distinctive feature of this region is the high demand for transport equipment which may even exceed the demand for non-electrical equipment particularly if current trends were to continue and the planners fail to restructure the regional economy.

12.2.2 The long-term forecast (2000)

Demand for capital goods in West Asia and North Africa in the year 2000 is expected to exceed $US 188 billion under the high-off trend alternative. The lowest forecast (LT) is slated to be about $US 113.3 billion. The high forecast represents a sixfold increase over 1977 whereas the low forecast represents almost a fourfold increase. The range between the highest forecast and the lowest is over $US 74.8 billion or almost 66 per cent of the lowest forecast. In 1990, this range was $US 21.1 billion or about 30 per cent of the lowest forecast then. The large range in the year 2000 is indicative of the importance of restructuring the region's economies on the patterns of demand. As such the forecasts under (HO) and even (LO) are planning forecasts; they depend on the decision-makers' ability to execute their plans.

The demand for machinery (electrical and non-electrical) will dominate all other demands for capital goods and equipment. The largest demand is expected to be for non-electrical machinery. The proportions of demand for these three major products are also sensitive to the trend versus off-trend assumptions. Invariably, the off-trend assumption involves larger demands for machinery over transport equipment. This is a natural outcome of the added importance accorded to the manufacturing sectors under the off-trend conditions.

Other special machinery dominates the demand for non-electrical machinery, followed by special industrial machinery. Of special significance in the year 2000 are also the expected demands for electric power machinery, power transforming machinery, road motor vehicles, trucks, lorries and buses, and manufacture of metals.

The long-term regional distribution of the demand for capital goods indicates a number of revealing patterns. First, the oil producing states are likely to raise their share in the total demand. Their forecast demand is $US 166.8 billion in the year 2000[74/]. This is almost 89 per cent of the

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74/ The corresponding production is forecast to be $US 23.5 billion in 1975 dollars which would be aproximately $US 50 billion at 1980 regional prices.

total demand under the off-trend high GDP growth hypothesis. The same share in 1990 is expected to reach 85 per cent. Thus, a greater polarization of economic activity is implicit in this system of forecasts. Even if the oil producing states were to experience low GDP growth rates and their industrial structures were to remain along their historical trends, whereas the non-oil producers were to experience high GDP growth rates and they were to succeed in moving their economies off their historical trends, still the region's non-oil producers would not represent more than 21.1 per cent. If both groups were to develop at the best stipulated forecast (the HOs), then the non-oil states' total demand for capital goods would represent only 12.8 per cent of the corresponding total of oil producing states.

There are a number of differences in the long-term emerging pattern of demand for capital goods between the oil and non-oil states. First, agricultural machinery, textile machinery, textile and leather machinery and power transforming machinery are the dominant products in the demand for capital goods in the oil producing states. Second, the relative range of difference between the alternative forecasts is much larger in the non-oil producing states than in the oil producing states. The percentage difference between the HO and the LT forecasts is 66 per cent for the oil producing states, whereas it exceeds 74 per cent for the non-oil states. Thus, careful planning in the non-oil states is a matter of necessity to maintain their respective shares and importance in the total regional market for capital goods.

Although the GCC region will remain as the major regional market area for capital goods in the year 2000, its share of this market (on the demand side) will decline slightly from 52.1 per cent in 1990 to 51.9 per cent in the year 2000.

12.3 Prospects and potential

A number of generalizations may be enumerated about the future magnitude and pattern of the regional demand for capital goods till the year 2000. First, the region is expected to represent a formidable market for capital goods of all kinds. Second, the oil producing states who represented a large

share of the region's demand in 1977, are likely to represent a growing share of the future demand. Third, demand for non-electrical machinery will likely grow larger than the corresponding demand for transport equipment, however, the forecast demand for the latter group is still inordinately high in proportion to the total demand for capital goods. Fourth, the forecast demands for capital goods are generally highly sensitive to the underlying assumptions about sectoral shares in the structure of GDP. Although the forecasts are sensitive to GDP, they are more markedly sensitive to the assumption about sectoral shares. Fifth, there are significant differences in the commodity pattern of the demand for capital goods among different parts of the region that suggests the need for regional strategies of production and/or procurement of these products.

Notwithstanding these stringent and demanding requirements of the capital goods industry common to all regions (regional co-operation, development of infrastructure, promotion of R+D and engineering services, etc.), the forecasts may be used as a basis for a preliminary illustrative discussion of developing selected capital goods industries in this region. UNIDO's forecasts presented elsewhere provide suitable guides to the individual, subregional and regional demand for 81 commodity groups.[75/] These demand forecasts need to be squared against estimates of minimum efficient scales associated with each product group and against the requisite engineering infrastructure and technology. This cross-classification could provide the grounds for identifying potential candidates for further feasibility studies.[76/]

The required factors involved in the production processes of each product must be identified in the light of the local supply situation, and costing should be carried out in terms of domestic and international prices in order to identify relative cost and technical feasibility.

75/ UNIDO/IS.451, op.cit.

76/ Detailed recommendations on joint-venture capital goods projects have been drawn up for 24 specific product groups and presented to the Arab Industrial Development Organization by UNIDO's Sectoral Studies Branch.

The fact that high and low conditioned forecasts are presented allows the industrial planners to define the critical bounds on the expected demand. For instance, if the minimum efficient scale is larger than the maximum demand, it follows that a viable industry in this field may not be sustained. If, however, the minimum efficient scale is somewhere between the minimum forecast and the maximum one, some hard choices need to be made and further feasibility studies may be needed.

Alternatively, the regional differentiation provided in the detailed forecasts,[77/] should help industrial planners in identifying the minimum geographical area that is capable of sustaining the industry under consideration.

The brief illustrative discussions below concern textile machinery, food processing machinery and electrical transformers.

Textile machinery. In 1977 the total regional demand for textile machinery was $US 425 million. By 1985, it is estimated that this demand will have reached $US 942 million under the off-trend high GDP growth assumptions. Even when trend sectoral shares were to remain in effect and regional GDP were to grow at slow rates, the demand for this type of machinery is estimated to be about $US 691 million. The corresponding demands in 1990 are $US 1.3 billion for the HT case and $US 860 million for the LT forecasts. By the year 2000, the HT conditions call for a demand of $US 2.5 billion, whereas the LT assumptions stipulate a demand of $US 1.2 billion (all the forecasts are in constant 1980 US dollars).

Bleaching, washing and dressing machines are expected to represent the major components of this forecast demand followed by spinning machinery. The technology of producing these machines is generally simple and the engineering infrastructure required for their production is generally available in the region particularly in Syria, Egypt, Iraq, Morocco and Algeria. Given also that subregional demands for these machinery are concentrated in the Fertile

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77/ UNIDO/IS.451, op.cit.

Crescent, Nile Valley and Maghreb regions, and are generally above the minimum viable efficient scale of production, a subregional orientation of production may be advisable.

The relative factor intensities used in the production processes of these products are generally less capital intensive than most other used in the production of capital goods and that is why it might be advisable to allocate the production of these machines to non-oil producing states in the region.

Food processing machines. There are already a large number of small mills, olive oil presses and oil seed crushers in the region, and there is at present some regional production of these machines. What is needed, however, is a rationalization of these activities which necessitates the use of larger and relatively more complex machines. The regional market for these machines is sufficiently large to allow for their local production. Big production plants involve complex domestic design, construction and maintenance capabilities which limit the candidates to produce these machines to only a few of the countries in the region. Besides, the capital requirements for the production of these machines is also relatively high, which restricts further the candidates or their sponsors. Saudi Arabia, Iraq, Algeria, Egypt and Syria are potential candidates. Other countries like Lebanon, Morocco, and Tunisia could enter production given multilateral investment and marketing agreements.

Our forecasts show that a demand of $US 1.2 billion in constant 1980 US dollars may be realized in the year 2000 for food processing machinery in the Arab world. Even the lowest scenario calls for a $US 552 million in the medium-term demand in 1990 is projected to range between a minimum of $US 332 million and $US 535 million.

Power transformers. The region's demand for power transforming machinery in 1977 was as high as $US 1.5 billion in constant 1980 US dollars. By 1985 the forecast is to range between a high of $US 2.9 billion and a low of $US 2.7 billion. The narrow range of the forecast is indicative of a robust and significant demand for this type of machinery even in the short run. The demand is slated to rise to $US 4.2 billion in 1990 for the (HT) forecast and

to $US 3.4 billion under (LO) conditions. By the year 2000 the high forecast is over $US 8 billion and even the low forecast is a significant $US 5.5 billion.

Since demand is presumed to be sufficient, supply factors play the crucial role in determining production strategies. A credible strategy would start with small power transformers for local distribution and power transmission of up to 15 MVAs. Demand in the region will most likely be concentrated in the 1.25 MVA variety where over 35,000 units may be needed.

Large facilities in a selected number of the countries may be started, particularly in countries with sufficient capital and metalworking industries. Since this industry is noted for split production possibilities, its initial development could be spread and shared.

The region is expected to continue to demand a significant amount of capital goods. This demand is going to be concentrated in the oil producing countries; however, since these countries are well spread geographically, the subregional groupings will form balanced economic entities within which capital goods production may very well prove viable and profitable.

Although the present analysis is primarily concerned with the demand side of the capital goods market an attempt was made to relate this demand to the main supply considerations. A complete and practical strategy for the production of capital goods in the region cannot be expected to emerge except in the context of comprehensive feasibility studies at the smallest homogeneous product group.

13. THE AFRICAN REGION[78/]

13.1 Global Overview

Africa is the least industrialized region amongst the developing countries in terms of both the African contribution to world manufacturing value added and the contribution of manufacturing industry to GDP per head of population.[79/] Starting from a low base, however, growth rates of manufacturing value added have been satisfactory in Africa compared to other developing countries. Nonetheless, the relative performance of growth in GNP per capita has been less satisfactory. Moreover, African manufacturing value added is highly concentrated in only a few sectors and in a small number of countries. Specifically food processing is relatively insignificant in most of the countries.

Table 27 shows that capital goods constitute a significant proportion of the region's total imports amounting to about a third for most African countries. The countries where this proportion is highest, amounting to 40 and 50 per cent, tend to be those involved in oil and mineral production and export.

Table 28 provides further information on the breakdown of capital goods imports identifying the most important items. Road vehicles accounted for an average of 28 per cent of total capital goods imports. The corresponding figures for the other items were: machines for special industry, 15 per cent; general industrial machinery, 14 per cent; metal manufactures, 13 per cent; power generating equipment, 6 per cent; telecommunications and sound equipment, 5 per cent; office machines, 1 per cent; and metalworking machinery, 1 per cent.

78/ References to Africa implicitly are to sub-Saharan Africa, exluding the Republic of South Africa.

79/ UNIDO/IS.502, op. cit.

Table 27. Imports of all capital goods a/ by country 1973-1980
(thousand $)

	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				69,486	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.

Table 28. 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	10.7	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						
Guinea-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	8.24	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).

In discussing imports of capital goods, reference should be also made to the imports of spare parts and components which have been identified as a major constraint on capacity utilization. It was estimated that in 1981 African countries spent 4.1 billion US dollars (fob) on imported spare parts and components and that between 1980 and 1985 this would amount of 26 billion.

African capital goods exports are insignificant in comparison to capital goods imports (see table 29), 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), Senegal (0.15), and Mauritius (0.10). However, for eight countries capital goods exports were more than 3 per cent of total exports. These, in descending order, 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).80/

In table 30 further information is provided on the breakdown of capital goods exports by African countries. In the case of Senegal, for example, which had the highest ratio of capital goods exports to total exports and the second highest ratio of capital goods exports to capital good imports, 31 per cent of the exports of capital goods consisted of metal manufactures not elsewhere specified. The corresponding figures for the other items were: road vehicles, 22 per cent; other transport equipment, 13 per cent; machines for other industry, 10 per cent.

Data on the production of capital goods is provided in table 31 and 32 in terms of Value Added in the capital goods sectors of the African countries. The value added in this sector as a proportion of total manufacturing value

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80/ It should be noted some of the exports are re-exports to landlocked African countries, as well as that some of the imports by certain countries are not for their own consumption but for re-exporting.

Table 29. Capital goods[a/] exports by country 1973-1980
(thousand $)

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		15,400		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	449					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 30. 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
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				87.94
Madagascar*	(1980)		100.00							
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.

ble 31. Breakdown of manufacturing value added, by ISIC category and by country
(current thousand $)

Country	Year	381	382	383	384	Total capital goods MVA
ola				n.a.		
in				n.a.		
kina Faso				n.a.		
				n.a.		
undi				n.a.		
swana	1979			n.a.		
	1980					
tral African public	1977	1,954				1,954
	1978	857				857
l				n.a.		
;o	1975					
	1976					
opia	1980	7,217		411		7,628
	1981	8,729		382		9,111
n	1977	20,257	2,626	12,030	16,732	51,645
	1978	17,090	2,216	10,150	14,115	43,571
ia	1978	230	n.a.	n.a.	n.a.	n.a.
	1979	80	n.a.	n.a.	n.a.	n.a.
a	1976	26,435	261	6,435	20,348	55,479
	1977	31,217	348	13,913	16,522	62,000
ea				n.a.		
				n.a.		
ea-Bissau	1978			n.a.		
	1979			n.a.		
y Coast	1978	57,589			60,342	117,931
	1979	69,142			70,039	139,181
a	1979	48,235	2,941	31,257	51,417	33,850
	1980	47,419	4,355	34,628	37,876	124,278
tho	1974	-29	n.a.	n.a.	n.a.	n.a.
	1975	57	n.a.	n.a.	n.a.	n.a.
ia				n.a.		
				n.a.		
;ascar	1977	7,381		2,247	6,229	15,857
	1978	7,096		3,528	8,656	19,280
i	1974	1,583	394		1,112	3,089
	1975	2,431	424		1,727	4,582
	1980	3,439	829	1,176	4,439	9,883
	1981	2,296	543	765	3,938	7,542
tius	1980		3,252	2,601	2,081	7,934
	1981		2,750	1,540	2,310	6,600
bique	1972	10,899	917	2,055	5,321	19,192
	1973	13,642	1,720	3,080	7,201	25,643
	1979					
	1980					
ia	1977	267,597	111,008	45,116	134,574	558,295
	1978	274,803	114,961	79,213	122,677	591,654
a	1978	1,034				1,034
	1979	1,529				1,529
al	1976					
	1977					
a Leone				n.a.		
				n.a.		
ia	1976	246				246
	1977	135				135
land				n.a.		
	1980	4,464	706			5,170
	1978	456	n.a.	n.a.	n.a.	n.a.
	1979	1,979	n.a.	n.a.	n.a.	n.a.
	1969	3,529	567	378	122	4,596
	1971	4,220	652	659	133	5,664
Rep. of oon	1977	953	11,256	2,854	1,242	16,305
	1978		16,166	5,195	2,060	23,421
Rep. of nia	1973	3,913	981	3,417	6,906	15,217
	1974	4,863	1,303	3,803	6,111	16,080
	1974	30,250	10,600	13,639	10,689	65,178
	1975	28,022	10,507	8,642	21,056	68,337
	1969	10,940	2,460	820	5,540	19,760
	1972	2,440	3,820	1,020	8,680	15,960
we	1979	114,975		27,854	32,843	175,672
	1980	170,760		4,403	38,342	253,133

SIC 381 = Metal products, 382 = Non-electrical machinery, 383 = ical machinery, 384 = Transport equipment.

ource: UNIDO data base - July 1984.

Table 32. Breakdown of manufacturing value added, 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	44.5		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 = Non-electric machinery, 383 = Electrical machinery 384 = Transport equipment.

Source: UNIDO data base, July 1984.

added. In a number of countries this figure exceeded 10 per cent. The highest proportion, about 25 per cent, is recorded for Gabon which is an oil-exporting country.

Several important points emerge from table 32 regarding the structure of the capital goods sector, both in the countries that have the largest capital goods sectors in absolute terms, 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 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 US dollars. These countries were Mauritius, Nigeria, Cameroon, Zambia and Zaire. Thirdly, in many cases ISIC 383 (electrial machinery) consists of a substantial proportion of goods that are not machinery, and therefore not a means of production. 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.

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

A recent UNIDO study on agricultural machinery and equipment in African countries has concluded that "the present indigenous agricultural machinery industry in most African countries is in such a 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."[81/]

81/ UNIDO, Agricultural Machinery and rural equipment in Africa. A new approach to a growing crisis, Sectoral Studies Series No.1, UNIDO/IS.377 (1983).

13.2.1 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 cost and unreliable 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 this sector than in many other parts of manufacturing industry. Nevertheless, 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.

Constraints limiting the possibility of exporting capital goods are also important. One major difficulty results from the fact that both African labour costs as well as productivity levels tend to be unfavourable relative to other more industrialized 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. Studies in other developing countries have shown this to be a significant source of productivity increase and competitiveness. However, 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 detailed analysis.

13.2.2 Supply-side constraints

Here attention is focussed on the constraints imposed by the shortage of foreign exchange, and the consequence of lower productivity and capacity underutilization, limited technological capabilities and skills, and the difficulties following from low quality inputs and the weakness of subcontractors and component suppliers.

A major problem confronting African countries follows from the inherent skill intensity of the capital goods sector and the shortage of skilled labour in these countries. To illustrate this point, estimates of the skilled labour requirements of a project to manufacture selected spare parts in African countries are examined. According to these estimates, 10 university graduate engineers would be required with a sum total of 160 years of experience. In order to place these figures in perspective, it can be noted that between 1964 and 1979 there were a total of 267 mechanical engineering graduates from Nairobi University in Kenya, one of the most industrialized of the sub-Saharan African countries. This does not, of course, suggest that a project to manufacture spare parts is necessarily unfeasible. It is, however, suggested that it is important to carefully consider whether such a project, utilizing as it does important skilled resources, is desirable in the light of the other alternatives available.

13.2.3 Other constraints

Particular attention should be given to the disadvantages that follow from a slow, and perhaps even negative, rate of growth of output. Studies in developing countries have suggested that relatively rapid growth in output might in a number of ways lead to gains in productivity. Unfortunately, African countries, as was seen in the discussion of their growth performance, have not been provided these benefits.

13.3 Some African strategies for developing the capital goods sector

Based on a survey of the latest development plans for individual African countries, these countries fall into two groups insofar as the capital goods sector is concerned. In the first group are countries which have no particular strategies for developing the capital goods sector, it is usually seen as merely one part of the metal processing sector.

In the second group are those countries which have not only identified the capital goods sector as a target for specific emphasis, but have also considered policies that it is felt will have to be introduced in order to develop this sector. Notable in this group are Nigeria and Kenya. In the

latter the desirability of introducing temporary protective measures to encourage the sector have been proposed. However, in a current study of the utilization of engineering skills in Kenya, it has been found that many difficult problems remain in promoting and strengthening the contribution of this sector.

Clearly the capital goods sector is still in its infancy stage even in the more industrialized African countries and virtually non-existent in many others. Where machine production does exist, it tends, for a large number of reasons, to be highly inefficient compared to elsewhere in the world.

The development of the capital goods sector will always have to be considered in the light of other available investment opportunities. Furthermore, the comparison between the price of a locally produced machine and that of an imported machine must be properly taken into account in any decisions to extend the local production of capital goods. Thus, it must be remembered that a locally produced capital good that is expensive and/or inefficient (compared to an imported one) carries its cost and other characteristics with it into the product it helps to produce. The development of a viable and economically sound capital goods sector is necessary in the long run but it must be a judicious process carefully considering true opportunity costs and implications for the industries using capital goods.

Appendix

Delimitation of Capital Goods According to ISIC and SITC Nomenclatures

A. ISIC Nomenclature

- Principal group 381: Manufacture of fabricated metal products
  part of group 3811: hand-tools, axes, hatchets, chisels, hammers, spades, hoes, rakes, other agricultural and garden tools, hand saws, tools for masons and plumbers and precision tools.
  Group 3813: structural metalwork

- Principal group 382: Manufacture of machinery except electrical, the whole of the group[82/]

- Principal group 383: Manufacture of electrical machinery, apparatus, appliances and supplies
  group 3831: electrical machines and equipment
  group 3832: part[83/]
  group 3839: part[84/]

Source: IREP, Université des Sciences Sociales de Grenoble, The Typology of Capital Goods, January 1980.

82/ An ambiguity exists within group 3825 which comprises, in addition to computers, products which are difficult to classify amongst capital goods (typewriters, etc.).

83/ Equipment for telephones, telegraph, radio and television; equipment for signalling and detection, radar, etc.

84/ Wires and cables, various connecting, switching and cut-out appliances, etc.

Principal group 384: Manufacture of transport equipment

group 3841: shipbuilding and ship repair work

group 3842: railway equipment

group 3843: vehicles with engines, excluding industrial vehicles

group 3845: aircraft

Principal group 385: Manufacture of scientific and professional equipment

group 3851: professional and scientific equipment; measuring and control equipment.

B. SITC Nomenclature (Revision 2)

In section 69: Manufacture of metals

only groups

691: structural metalwork

692: metal containers

695: hand-tools and tooling

In section 7: Machinery and transport equipment

division 71: power generating machinery and equipment

division 72: machinery specialized for particular industries

division 73: metalworking machinery

division 74: general industrial machinery and equipment

division 75: part (machines for data processing only)

division 76: part (telecommunications equipment only)

in division 77: Electrical machinery, apparatus and appliances and parts thereof

771: electrical power equipment

772: electrical circuitry equipment: cut-outs, switchgear, etc.

773: equipment for the distribution of electricity

778: miscellaneous electrical equipment

in division 78: Road vehicles

782: industrial vehicles

783: road vehicles

division 79: other transport equipment

division 87: professional and scientific and control instruments[85/]

85/ The section on projections uses a slightly different definition for capital goods in order to match corresponding ISICs and SITCs.

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