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**SMALL-SCALE ELECTRONICS INDUSTRY AS SUBCONTRACTOR
IN ASIA AND THE PACIFIC REGION***

Prepared by the
Regional and Country Studies Branch
Division for Industrial Studies

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PREFACE

The Regional and Country Studies Branch of the Division for Industrial Studies, UNIDO, within its studies and research programme, is giving particular attention to the role of small-scale industry as important segment of the industrial sector development process in developing countries.

A special series of issue-oriented studies and analyses were carried out as preparation for an Expert Group Meeting on Policies and Strategies for Small-scale Industry Development in Asia and the Pacific Region. The meeting is organized jointly with the ESCAP/UNIDO Division of Industry, Human Settlements and Technology, and will be held in Seoul, Republic of Korea on 17-20 September 1985.

In this connexion a number of key issues were singled out:

- Firstly, existing small-scale enterprises have typically such low level of technology, unstandardized products and scant links with the existing large-scale enterprises, that they are active in a distinct area of the economy, which has little relation with modern industry and little autonomous prospects of growth and modernization;
- Secondly, small-scale industries like other industrial plants tend to be located in urban centres of growth, i.e., they concentrate around the capital city. Decentralization and dispersal of industrial activities are thus an essential development objective of Governments in many countries. Small industries are one particular group of industries subject to such policies;
- Thirdly, the small-scale industry sector is increasingly exposed to emerging new technologies. It has been well recognized that recent innovations, such as numerically controlled machines, computer-aided design or microprocessor-based information and control devices are potentially applicable to traditional producers.

The listed three major issues call for systematic analysis to ensure the enhanced development of small industries in the future.

The present study is concerned with one of these issues: the impact of technological innovations on the small-scale electronics industry in developing countries in Asia and the Pacific region. The aim of the study is to identify the need for small-scale electronics industry in this region, and

to create an awareness of concerned policy-makers to the specific technological challenges and opportunities affecting this sector.

The study is primarily based on a review of available data and reports on this issue as well as field investigations in selected developing Asian countries. The study is thus attempting to outline the complex area of issues for consideration and discussion by the planned regional expert group meeting which will provide an important forum for eventual formulation of policy recommendations.

The study has been prepared by Karl Heinz Plaetzer as UNIDO consultant in co-operation with staff of the Regional and Country Studies Branch, Division for Industrial Studies, UNIDO. Mr. B.N. Yugandhar, Regional Adviser at ESCAP/UNIDO Division of Industry, Human Settlements and Technology, Bangkok, assisted in the preparation of the study.

1. LINKAGES BETWEEN SMALL-SCALE AND LARGE-SCALE ELECTRONICS INDUSTRIES

1.1. Small-scale industry in industrialized and developing countries: some features

Small-sized engineering enterprises in industrialized countries are mainly suppliers of intermediate goods, parts and components to other, mostly large, industries. The small enterprises have relatively close linkages with their customers and co-operate on specific tasks; they also specialize in the production of various high technology items. In contrast, in developing countries, such enterprises are predominately manufacturing end products. The degree of specialization of these small- and medium-sized companies is comparatively less pronounced, the linkages with their customers as well as inter-industry co-operations are scarce. Extension of business activities is normally sought for by increasing scope of production rather than by specialization and deeper market penetration (with, mostly, less competition) with a well-tailored limited product range.

The reasons for these differences are manifold. They can be largely referred to the relatively short industrial history of the developing countries; at early stages of industrial development the mere physical production of goods tends to play a predominant role. With advances in industrialization other functions of the enterprise increase in importance, such as marketing, organization and technological innovation. Hence there is a transition of importance towards more efforts in planning, analysis and control of operations and functions, research and development and development of human resources. For the advancement of small-scale industry in developing countries, the enhancement of innovative entrepreneurship and upper business management can thus be seen as a basic requirement, as can be observed in industrialized countries and in number of relatively advanced developing countries, such as Brazil, Republic of Korea and Singapore.

This indicates that a development towards specialization of production - concentration of efforts on specific engineering tasks and subcontracting and complementation - is to be expected in the developing countries. It can also be foreseen that some small-scale industries will increasingly manufacture end products and grow into medium- or big-size enterprises, maybe also through

merging with competitors. Others will switch to specialized production of components and parts. These specialization and development efforts require that the firms are able to cope with the increasing competition and have the required flexibility to adjust to the changing market conditions.

The majority of small-scale electronics industries in industrialized countries usually operate for several customers on a subcontracting basis. The customers, on the other side, have normally several supply sources for the same product. In the case of end product manufacturing by small industry, marketing through established distribution channels is predominant unless the product is highly specialized and demanded by a limited number of customers. In this case, direct sales are commonly chosen.

Marketing differs considerably between cottage and small-scale industries in industrialized and developing countries. It is given much more attention by the entrepreneurs in industrialized countries; special sales promotion (catalogues, product descriptions) is much wider applied. The efforts of the enterprises are often complemented by supporting measures by associations or by governmental agencies. In some countries government purchasing regulations can make it obligatory that the supplier subcontracts considerable parts of his contract volume to small industries.

1.2 Structural aspects of small-scale engineering industries in developing countries

Small-scale industries in the engineering industry sector in developing countries can be said to range between two extremes:

- (i) The traditional, labour-intensive enterprise which is manufacturing relatively low priced products of low technological complexity and low quality standards; and
- (ii) the modern, more physical and human capital-intensive and less labour-intensive, technologically advanced and flexibly operating enterprise which manufactures products of high quality standards.

These two categories have a different type of machinery and equipment and completely different plant operations. They have different sales market conditions and require different marketing efforts.

An entirely different approach for the promotion of these two groups of small-scale industries is obviously also required. While the first category needs technical assistance to improve its economic and technical status, the second category requires mainly pre-investment guidance and favourable environment in terms of legal, fiscal and business services and policies which can direct human resources and venture capital towards the creation of these new engineering industries. Also the setting up of service companies for computer hardware and small software generating enterprises as well as systems analysis and engineering companies would constitute an important type of support.

1.3 Inter-industry linkages

The increasing role of small-scale industries and the growing utilization of their dynamism is largely dependent on the degree of economic and - above all - inter-industry linkages in the country concerned. The development of industrial linkages in manufacturing in turn obviously presupposes a sizeable industrial production structure and an awareness in decision making of costs and benefits of a division of labour within the industrial sector. This implies that industrial linkages in general and between small and large industries in particular are easier to achieve in developed economies than in developing economies. Competition in the industrialized countries has forced industries to purchase production inputs at lowest possible cost so that the competitiveness of the end product would not suffer. This has led to the establishment of supply industries which concentrate their efforts on specific products and improve their quality and performance above average through research and product development.

The following review of basic features required for establishing such linkages at the macro and micro economic level may illustrate this point and at the same time pinpoint the policies required for achieving an increasing linkage in developing countries.

A fundamental prerequisite for establishing inter-industry linkages are well functioning physical infrastructural conditions, both in terms of telecommunications and transport facilities for the delivery of goods. The importance of close communications for subcontracting can be shown by the fact that according to a survey in the Federal Republic of Germany approximately

50 per cent of all engineering industry subcontracting activities were within 50 km distance from the purchasing companies. (This also means that subcontracting industries should not be subject matter of industrial decentralization policies.)

While subcontracting linkages basically develop as a part of a market-induced development process, as can be observed in Europe, the establishment of linkages can be accelerated to a large extent through special governmental promotional measures. The experiences of several developing countries such as the Republic of Korea, Brazil, Venezuela and Mexico indicate that promotional policies can be of key importance to encouraging the establishment of linkages. Purchasing policy of government agencies and contributions to joint (small- and large-scale industry) research and development projects are common measures.

Besides such specific policies also the design of general macro economic policies such as customs, tax and industrial policies play an important role for establishment of inter-industrial linkages. Reduction of customs duties for raw material imports and increase of duties on parts and components are common policies. The abolition of cumulative sales taxes and introduction of value added tax is another example of incentives for domestic subcontracting.

Subcontracted electronics industries in industrialized countries usually have high technological know-how requiring highly educated entrepreneurs and labour. The development of these resources requires high ranking educational facilities, postacademic research, etc. that most developing countries do not possess. Major efforts in the educational systems are clearly called for.

It is the awareness of the benefits of specialization and of its cost-reducing effects among entrepreneurs coupled with possibilities of resources mobilization and of risk sharing in research and development, that has largely generated the growth of the small industries as dynamic parts of a network of industrial companies.

In this connexion it can be mentioned that engineering creativity of employees in a large company has generally been an important source of the creation of new "spin-off" small-scale enterprises in the industrialized

countries. In many cases these new companies remain in subcontracting business relations with the former employing company. In recent years this is especially the case for newly founded small enterprises in the electronics hardware and software area. Also in developing countries these tendencies are noticeable.

1.4 Forms of linkages between small- and large-scale engineering industries

Among the various linkages between small- and large-scale engineering industries, subcontracting is by far the most important form of co-operation. Complementation, maintenance and repair services for equipment and sales dealerships with partial assembly or repair services are also relatively common types of co-operation. Franchising should also be mentioned even though it plays a reduced role for the engineering industries.

(i) Subcontracting

The term subcontracting usually encompasses two distinct forms: industrial and commercial subcontracting. Industrial subcontracting is a contractual arrangement between a primary company (purchasing company) and a secondary company (subcontracted company) for

- the supply by the subcontracted company on order from the purchasing company, of parts, components, sub-assembly and assemblies that are then incorporated in a product sold by the primary company; or
- the processing of materials for the primary company - whether the materials are provided by it or not - and the processing or finishing of parts provided by and returned to the primary company.

Commercial subcontracting relates to the production of finished products for a company which is not engaged in manufacturing but in sales (e.g. department store chains, dealers). Both forms of subcontracting exist both on the national and the international level. International subcontracting is mostly made in the form of commercial subcontracting.

A further distinction can be made between purchasing-, supply- and task-oriented subcontracting. Purchasing-oriented subcontracting entails the manufacturing of specialized parts and components produced according to an order by the purchaser; usually these parts or components are not generally

tradeable as they are to be subject to further processing or assembly operations. The subcontracted company thus depends strongly on the purchasing company.

Supply-oriented subcontracting refers to the manufacturing of parts or components which were identified as market opportunities by the producer or which emerged from his research and development activities. These products are usually sold to several clients as they can be used in various end products. This type of subcontracting is relatively common in the automotive, electrical and electronics industry.

Task-oriented subcontracting means that the subcontracted and the purchasing company jointly develop and produce new parts, components and end products. This form implies a high research and development capability of the subcontracted company offering an attraction for the purchasing company.

In supply- and task-oriented subcontracting, the subcontracted company is more independent and stronger towards the purchasing company than in the case of purchasing-oriented subcontracting.

(ii) Complementation

Complementation implies that the products manufactured in one (small specialized) company are complementary to the production in another company. Typical complementation is the production of standardized products such as bolts, screws or electronics passive and active components. These products are all marketable by themselves which is the major distinction to subcontracting. However, in specific cases a distinction between complementation and subcontracting can be difficult, e.g. in the case of development and production of special bolts, fastening devices or electronic components which were originally conceived for one purchaser but which in the course of production become generally marketable items, eventually with own standards. A subcontracting scheme thus can develop into a complementation scheme, and the product can change from a non-tradeable to a generally tradeable item.

(iii) Maintenance and repair services

In industrialized countries the number of small-scale enterprises specialized in equipment maintenance and repair under service agreements is expanding. The service agreements are either concluded with the equipment producer or with the equipment user. In the first case regionally exclusive service rights are normally granted to the service company, in the second case the service company most likely specializes on a certain type of equipment regardless of the producer.

In developing countries maintenance and repair services under contractual agreements are generally still in their initial stage. Their future potential will depend on the awareness of the equipment user of the advantages and cost reductions resulting out of well maintained production and auxiliary equipment through specialized services. Such awareness is usually directly related to the level of technology of the equipment; the more advanced the equipment, the greater is the awareness of the prospective benefits of preventive maintenance.

2. SMALL-SCALE ELECTRONICS INDUSTRY IN THE DEVELOPING ASIAN AND THE PACIFIC REGION: AN OVERVIEW

2.1 The relative importance of engineering industries

In order to identify prospects for the electronics industry as supplier of components and parts to be engineering industry as a whole in the various countries, the relative size of the engineering industry production may serve as a first indicator.

As Table 1 shows a number of countries in the region have a sizeable engineering sector. The share of this sector in total manufacturing, however, shows substantial differences: it varies between 52 per cent in Singapore and 6 per cent in Bangladesh.

Table 1. Share of engineering industries in manufacturing value added
(latest year)

| | Year | Share of engineering industry ^{a/} in total MVA |
|-------------------|------|--|
| Bangladesh | 1979 | 6.1 |
| China | 1982 | 22.0 ^{b/} |
| Hong Kong | 1980 | 33.0 |
| India | 1978 | 26.0 |
| Indonesia | 1980 | 16.9 |
| Malaysia | 1979 | 23.4 |
| Pakistan | 1977 | 10.1 |
| Philippines | 1979 | 13.8 |
| Republic of Korea | 1980 | 21.8 |
| Singapore | 1981 | 51.6 |
| Sri Lanka | 1979 | 11.0 |
| Thailand | 1975 | 18.6 |

^{a/} ISIC 3810 (fabricated metal products), 3820 (machinery, except electrical), 3830 (machinery, electric), 3840 (transport equipment).

^{b/} Share of gross industrial output.

Sources: (i) UNIDO Data Base. Information supplied by the United Nations Statistical Office, with estimates by the UNIDO Secretariat.

(ii) Country Industrial Development Review: People's Republic of China (forthcoming), Regional and Country Studies Branch, UNIDO.

The data contained in the table may be supplemented with further relevant information. India has, as a result of its set development objectives, policies of investment planning, and the absolute size of her economy and industry sector achieved a relatively high share. The share of engineering industries in the ASEAN countries is still limited but is growing rapidly contrary to other Asian countries. Singapore's development of the engineering industries has to large extent been achieved through the country's export promotion policy. The growth of the engineering industries in the Republic of Korea, is attributable to both import substitution and export promotion policies.

Manufacturing within the framework of internationally operating companies (offshore processing) of electronic components and devices plays a role in all these countries, except to China. However, the originally expected technological 'spill-over' effects, through the promoted offshore manufacturing of international companies, have by and large remained limited. Whereas thus entirely international offshore manufacturing apparently had little effect on the development of a domestic electronics industry, offshore manufacturing in form of joint ventures with domestic partners seems to play a more positive role. Prima facie, large industries rather than small-scale establishments seem to have profited by technology transfer through joint ventures.

There are approximately ten developing economies in Asia and the Pacific region where domestic inter-industrial linkages between small-scale electronics and large scale engineering industries are of a noticeable importance. These economies are China, Hong Kong, India, Indonesia, Malaysia, Pakistan, the Philippines, the Republic of Korea, Singapore, and Thailand. As information and statistical data on small-scale electronics industry in China were not accessible during field work, the following chapters exclude discussion of the linkage potential in that country.

The case of Singapore shows that, in spite of a limited domestic market, development of an engineering industry sector has reached a relatively high share in the manufacturing value added of the country. This example also shows that human resources development is a major asset for establishing an engineering industry and, likewise, an electronics industry.

Despite efforts to foster industrial co-operation at inter-country level results have so far been rather limited. This is mainly due to the limited size of the engineering industry sector in general and the electronics sector in particular in the countries in the region. Moreover, there is a lack of complementarity of production among the countries concerned: most of the countries produce the same items and import other items from outside the region. The items produced are usually also highly protected by import duties or other import barriers.

2.2. Small-scale^{1/} electronics industry in selected countries

(i) Southeast and east Asian countries

Indonesia

Small-scale industry, including cottage industry, gives employment to over 80 per cent of the 4.5 million Indonesians engaged in manufacturing activities in 1980. However, employment in small-scale industry has declined from 1974 by 1 million persons and is believed to further decline in future years.^{2/} Approximately 8 per cent of employment in small-scale industry is in the metal, machinery and equipment sector to which electronics belong, giving a figure of approximately 288,000 employees.

It is estimated that more than 5,000 small-scale industries manufacture or assemble of electrical and electronic products. A great number of them are

^{1/} There is no uniform definition among ESCAP member countries on cottage or household, small-scale, medium-scale and large-scale industries; even within countries there might be different criteria applied by different government or banking institutions. Annex 1 shows different definitions of small-scale industries either official or customary in ESCAP developing countries.

The definitions are so heterogeneous that their strict application would present difficulties both in data collection as well as in interpretation and reproduction. To overcome these difficulties and inconveniences and to comply with the form in which figures are normally published the term 'small industry' has generally been used for enterprises with less than 50 employees.

^{2/} World Bank, Staff Appraisal Report on Third Small Enterprise Development Project, 1983.

active as subcontractors to medium- and large-scale industries, e.g. in the production of transformers for TV and radio sets, ballast for fluorescent lamps, fabrication of printed circuits etc. Generally, the subcontracting companies receive all production inputs from the purchasing company which also inspects product quality. Thus, the subcontracting company can be looked at as an external extension of the work bench or production line of the purchasing company. As the subcontractors normally work for only one company they are completely dependent on business development with their purchaser.

The Government has introduced protective measures and schemes for co-operation between the small-scale industries and the medium- and large-scale purchasing companies. Such schemes include product reservation schemes and "foster-father"-schemes for linkages between the unequally strong industries which will be described in Chapter 3.1.

Small-scale industries producing directly for the market are normally also engaged in repair services in their product areas. The production operations are on average of low technology and high labour-intensity. The technological innovation capacity is considered to be very limited and the product quality is the most critical factor, both for end products and for subcontracted parts.^{1/} There is no significant Government support for research and development support in this sector.

Recently, a nucleus has been formed of relatively high technology, small-scale electronics industries, started mainly by young professionals with a research and development background after their academic studies. According to the Ministry of Industry these industries number approximately 15, mainly in the professional electronics and process control field. The regional centre for these activities is, as well as for traditional industries, Bandung. There are Government plans to actively support those industries, The Ministry is considering measures to enhance this development which would broaden the technological scope of production in small-scale industry considerably.

^{1/} Joint project of Directorate General of Small Industry and UNIDO/UNDP, project No. DP/INS/78/078, Report No. 9, 1983.

A similar development can be seen in software production by small companies for external clients, either directly for computer users or as a complementation to computer hardware sales organizations.

Malaysia^{1/}

In the past the Malaysian policy measures were mainly directed towards attracting foreign capital for export production and this contributed to making Malaysia a major exporting country of electronic components. Foreign investment is accordingly predominant in Malaysian electronics industry, 80 per cent of paid up capital is held by foreign companies who dominate in the offshore component manufacturing. Companies producing primarily for the domestic market require a Malaysian majority. Out of a total of 136 companies 78 are wholly or by majority foreign owned and 58 have Malaysian majority. The electronics industry has a sales volume of approximately US \$1 billion and is employing 65,000 persons.

Approximately half of the domestically owned companies, i.e. about 30 enterprises, belong to the small-scale industries sector. They mainly assemble consumer electronics for the domestic market and some enterprises are also engaged in parts production. Subcontracting activities, especially with the large foreign companies engaged in offshore manufacturing, are very limited. Indeed, there were only very few attempts by foreign companies to establish local subcontracting links.^{2/} The Government has designed promotional measures in form of tax incentives for local subcontracting.

Small-scale industry production is characterized by labour intensive, relatively low technology operations. High technology companies hardly exist although the Government lately increased its promotional efforts in this respect.

^{1/} The comments are mainly based upon the ESCAP study 'Regional study of the electronics industry', covering Bangladesh, Malaysia, Pakistan, Singapore, Sri Lanka and Thailand, August 1981.

^{2/} Linda Y.C. Lim and Pang Eng Fong, Vertical Linkages and Multinational Enterprises in Development Countries, World Development, Vol.10, No.7, p.586, 1982.

Republic of Korea

Total manufacturing output in this country grew at an annual rate of 35 per cent between 1970 and 1980. The electronics industry showed 40 per cent growth per annum, in the same period and its share in manufacturing value added rose from 2.4 per cent in 1970 to 5.7 per cent in 1980. Approximately 70 per cent of production was exported in 1980. Production of the electronics industry rose from US \$0.2 billion in 1972 to US \$0.8 billion in 1974, US \$1.4 billion in 1976, US \$2.3 billion in 1978 and US \$3 billion in 1980.

A comparison of the structures of the electronics industry of two industrialized countries - USA and Japan - and two of the more advanced of the developing countries - India and the Republic of Korea - is given in Table 2. As can be seen, the Republic of Korea and Japan both favoured the development of consumer goods while in India development policies and planning favoured the production of professional electronics. Offshore manufacturing (semiconductor assembly) represents an important contribution to the Korean electronics industry.

Table 2. Comparison of electronics production by sector in
the USA, India, the Republic of Korea and Japan, 1977
(Per cent of total output)

| Sector | USA | India | Republic of Korea | Japan |
|---|-----|-------|-------------------|-------|
| 1. Consumer electronics | 15 | 26 | 38 | 38 |
| 2. Components | 17 | 18 | 33 | 30 |
| 3. Professional electronics | | | | |
| 3.1 Aerospace and defense | | | | |
| 3.2 Telecommunication | 68 | 56 | - | 32 |
| 3.3 Control, instrumentation and industrial electronics | | | 11 | |
| 3.4 Computers | | | - | |
| 4. Semi-conductor assembly | | | 18 | |
| All sectors | 100 | 100 | 100 | 100 |

Source: Morehouse and Copra, "Chicken and egg: Electronics and social change in India", Research Policy Studies, Lund, Sweden, 1983.

The structure of the electronics industry is shown in Table 3. Of the some 700 companies 103 were joint ventures and 44 were foreign owned, the remainder representing domestic enterprises. The production share of domestic enterprises in 1980 was 49 per cent, and the share in exports 48 per cent.

Table 3. Republic of Korea: Structure of the electronics industry

| Employees | Number of establishments | | | | Production share in 1978 Per cent |
|---------------|--------------------------|----------|--------|----------|---|
| | 1970 | | 1978 | | |
| | Number | Per cent | Number | Per cent | |
| Over 2,000 | 4 | 3 | 17 | 2 | 39 |
| 1,000 - 2,000 | 3 | 2 | 30 | 4 | 16 |
| 500 - 1,000 | 9 | 5 | 62 | 9 | 11 |
| 100 - 500 | 41 | 23 | 294 | 42 | 25 |
| below 100 | 118 | 67 | 307 | 43 | 9 |
| Total | 175 | 100 | 707 | 100 | 100 |

Source: World Bank, Korea Electronics Technology Project, 1980.

While the Government policies favoured the large (foreign or domestic) enterprises in the 1970s and early 1980s the policy measures have lately shifted towards promoting small- and medium-scale enterprises. This has led to a strong increase in the creation of new small enterprises. The 1984-85 Directory of Electrical and Electronic Manufacture in Korea (published by the Electronic Industry Association of Korea) lists 136 companies with up to 50 employees. Of these companies, 33 are up to two years old, 58 up to four and 75 up to six years old. Membership of small companies in the Association rose from 103 in 1982 to 124 in 1983 and 136 in 1984. The newly established small-scale enterprises are mainly in the high technology area.

Singapore

Singapore's electronics industry produces, like in Malaysia, mainly for export markets. Owing to labour shortages Singapore has switched from a labour-intensive policy to technological upgrading and automated production as well as to a broadening of the scope of production by diversifying from

semiconductor and consumer goods manufacture towards professional electronics products, mainly computers and peripheral products. The country's electronics industry grew from US \$0.25 billion in 1971 to US \$5.73 billion in 1981. Total employment is in the order of 70,000 persons in approximately 200 enterprises of which approximately 50 per cent are large international companies, partly operating in form of joint ventures.

According to a publication of the Association of Electronic Industries in Singapore (AEIS) there were in 1983 35 small-scale industries (less than 50 workers) registered in the electronics sector and 30 small-scale enterprises registered in the electrical sector. Production ranges from relatively low technological products like cable trimmings to high technology hardware, engineering and software products. End product manufacturing small-scale enterprises are in minority among the registered units.

While in the 1970s linkages between large- and small-scale industries were poorly developed the picture is changing rapidly since the beginning of the 1980s. According to AEIS there are approximately 120 firms supporting the approximately 200 electronics producers. A survey of 30 electronics companies showed that approximately 50 per cent of parts and components were locally purchased. Most foreign companies grant technical assistance to the generally small-scale local supplier but insist on international competitiveness in price, quality and delivery times of their local suppliers. Usually a policy of having several local (or international) supply sources is followed by the large companies. Government policy in manpower development, partly through government-industry co-operative training centres or through training grant schemes to industry for on the job training, and a small industry financing scheme as well as the product development assistance scheme for local companies have strongly contributed to the strengthening and modernizing of domestic small-scale industry.

Thailand^{1/}

Thailand's electronics industry consists of companies servicing mainly the domestic market with some (occasional) export activities and offshore

1/ Main reference: Narongchai and Associates, Industrial Restructuring in Thailand: The Case of Electronics and Electrical Industry, 1982.

manufacturing large units of international companies producing integrated circuits for export markets with (occasional) supplies to the local market. The electronics and electrical industry employs about 50 to 60,000 persons in 400 to 500 establishments of which 90 per cent are located in Bangkok and surrounding provinces. The electronics industry, apart from offshore semiconductor manufacturing, consists of approximately 50 to 60 major enterprises producing almost exclusively consumer goods. There are approximately 10 small enterprises with a market share, estimated by the industry, of approximately 15 per cent assembling imported CKD-television sets and approximately 20 small enterprises assembling imported CKD-radio and radio cassette sets with a market share of approximately 30 per cent. These companies started partly their assembly operation in 1982 when the import duty scheme was changed to favour CKD imports instead of raw materials.

Due to the current tax structure which foresees taxation of all industrial sales (regardless of end product or intermediate product) through the business tax scheme, and the prevailing import duty schemes with partly higher import levies on raw materials than on SKD or CKD components and parts, as well as little if any promotional support for small enterprises, local subcontracting is practically nil. However, there is a relatively large number of small enterprises, mainly active in repair or remodeling of defect electrical appliances, TV, radio and audio equipment.

(ii) South Asian countries

Bangladesh^{1/}

The electronics industry of Bangladesh is at an early stage of development. Several small-scale enterprises are engaged in the manufacture of radio receivers: in 1979/80 295,000 radio sets were assembled by 28 companies. The assembly is based on imported kits, locally produced or locally subcontracted are knobs, springs, battery holders and transformers. As regards assembly of TV sets, all electrical and electronic parts and

^{1/} The comments are mainly based upon the ESCAP study 'Regional study of the electronics industry', covering Bangladesh, Malaysia, Pakistan, Singapore, Sri Lanka and Thailand, August 1981.

components are imported in form of kits. There is also some local production capability for telephone and associated equipment. Yet, facilities for designing and etching printed circuit boards do not exist. One company produces an electronics module for a European buyer. Domestic or international subcontracting hardly exists, and even small industry is mainly engaged in end product manufacture. The Government is keen to further develop the electronics industry for domestic and export markets, both in consumer and in industrial products.

India^{1/}

The annual turnover of the Indian electronics industry is in the range of the Malaysia's (US \$ 1 billion in 1980) yet the structures of the two countries' industries differ completely. While the Malaysian electronics sector is geared towards exports and consists mainly of offshore manufacturing units run by transnational companies, India has since the early 1970s followed a policy of achieving self-reliance in electronics. This has led to India having the most complete scope of production of electronics products among the developing countries in Asia and the Pacific region. However, due to the predominant reliance of technological innovations in the past and the limitations of acquiring the most advanced foreign technologies, the country's industry could not always keep pace with the rapid technological changes. In many product areas India does therefore not dispose of most modern technologies. Realizing the growing technology gap in specific areas the Government has now started specific technology transfer activities including licencing, technology purchasing and joint venture agreements with foreign companies.

Indian production of electronics products grew from 1970 to 1981 by approximately the factor 2.6. Table 4 represents the development of the Indian electronics industry between 1971 and 1981. Highest growth, yet starting from a relatively low original value, is experienced by computers and

^{1/} Main reference: Ward Morehouse and Ravi Chopra, "Chicken and egg: Electronics and social change in India," Research Policy Studies, Lund, Sweden, 1983, and "Electronic Industry in India," Economic Intelligence Service, Centre for Monitoring Indian Economy, Bombay, India, February 1983.

Table 4. India: Profile of electronics, 1971-1981
(production in constant prices value in Rs. million)

| | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 |
|---|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|--------------|
| Production | | | | | | | | | | | |
| 1. Consumer electronics | 520 | 566 | 564 | 543 | 485 | 591 | 736 | 879 | 997 | 992 | 965 |
| 2. Communication and broadcasting | 400 | 434 | 545 | 514 | 589 | 655 | 728 | 711 | 716 | 855 | 599 |
| 3. Aerospace and defence equipment | 280 | 269 | 300 | 336 | 290 | 292 | 314 | 346 | 337 | 315 | 268 |
| 4. Computers, control and industrial electronics | 130 | 155 | 200 | 243 | 346 | 374 | 585 | 664 | 730 | 741 | 733 |
| 5. Components | 400 | 402 | 464 | 514 | 444 | 468 | 517 | 653 | 6758 | 755 | 673 |
| 6. Production in Santacruz electronic export processing zone, Kandla Free Trade Zone and bonded factories | - | - | - | - | 3 | 18 | 23 | 42 | 64 | 76 | 99 |
| Total production | 1,730 | 1,826 | 2,073 | 2,150 | 2,157 | 2,398 | 2,902 | 3,295 | 3,602 | 3,235 | 3,331 |
| | <u>1971-72</u> | <u>1972-73</u> | <u>1973-74</u> | <u>1974-75</u> | <u>1975-76</u> | <u>1976-77</u> | <u>1977-78</u> | <u>1978-79</u> | <u>1979-80</u> | <u>1980-81</u> | |
| Growth rates^{a/} | 109.5 | 110 | 140 | 169 | 171 | 175 | 179 | 180 | 216 | 257 | |

^{a/} Base 1970-71 = 100. (Index for wholesale prices, Base 1970-71 = 100: Category III: Manufactured products.)

Source: Reserve Bank of India Bulletins, quoted by Morehouse and Chopra.

industrial electronics which reflects the Indian policy to emphasize the development of capital goods rather than that of consumer goods industries.

Small-scale industry has a share of one-third in total production of the electronics industry (Table 5). In consumer electronics it even achieves two-thirds of production output. However, it is not active at all in communication and broadcasting and in aerospace and defence equipment. Compared to other countries, the small industries' share in industrial electronics and computers and office equipment (36 per cent and 28 per cent, respectively) is high and indicates the relative strength of modern, high technology, small-scale industries.

Table 5. India: Electronics production by type of enterprises, 1981

| Sector | Total production Rs. million | Share of public sector units (per cent) | Share of organized private sector units (per cent) | Share of small-scale units (per cent) |
|---|------------------------------------|--|--|--|
| 1. Consumer electronics | 2,460 | 9.02 | 24.56 | 66.42 |
| 2. Communication and broadcasting equipment | 1,540 | 95.17 | 4.83 | - |
| 3. Aerospace and defence equipment | 690 | 99.49 | 0.51 | - |
| 4. Control instrumenta- tion and industrial electronics equipment | 1,560 | 35.39 | 28.49 | 36.12 |
| 5. Computers and office equipment | 325 | 30.15 | 42.16 | 27.69 |
| Total equipment | <u>6,575</u> | <u>47.15</u> | <u>18.88</u> | <u>32.97</u> |
| 6. Electronics components | 1,730 | 28.03 | 39.15 | 32.82 |
| Total | 8,305 | 43.25 | 23.02 | 33.73 |

a/ Excluding production worth Rs. 255 million in Santacruz Electronics Export Processing Zone.

Source: S.L. Sarnot, "Electronic components industry: Perspective for growth in the 80s" in Electronics for you, Annual Number 1983, New Delhi, India.

As regards electronic components, small-scale industry is not active in the production of electron tubes and semiconductor devices (with the exception of a very limited production of power semiconductor devices). On the other hand it has production shares of more than 50 per cent in resistors and other components and about 25 per cent in capacitors (Table 6). However, production costs are comparably high and product quality in many cases is said to be so low that the components cannot be used for industrial applications but only for consumer goods. Even those products are, according to reports, affected in their quality and lifetime. In some cases it is expected that production of components in small-scale industrial units will discontinue.

India's electronics exports are limited and accounted for only US \$56 million in 1981. Production of software has been called India's "billion dollar hope" due to the availability of large numbers of well-trained scientists and engineers in the country. However, so far software exports have remained low. In 1980 they amounted to only approximately US \$10 million in 1980. Morehouse and Chopra give the following explanation for this disappointing performance:

"... that hope (of huge export volumes) has been largely illusory because of a number of complicated factors, among them, at least according to industry critics of Government policy, the reluctance of the Government to permit import of the very latest generation of computers which the software industry regards as essential if it is to compete successfully for software contracts in industrialized countries that will operate on such equipment."

The authors also claim that this factor and the slow progress due to administrative barriers in domestic research and development is a major cause also for the widening gap especially in computer technology between India and industrialized countries.

Table 6. India: Production of selected electronic components, 1981
(Quantity in million numbers and value in Rs. million)

| | Organized sector | | Small-scale sector | | Total | |
|--|------------------|----------------------|--------------------|---------|----------|--------|
| | Quantity | Value | Quantity | Value | Quantity | Value |
| <u>Resistors</u> | | | | | | |
| Carbon film resistors | 174 | 18.56 | 75 | 5.00 | 249 | 23.56 |
| Metal film/oxide resistors | 1.33 | 3.57 | 1.65 | 1.60 | 1.98 | 5.17 |
| Wirewound (fixed) resistors | - | 0.80 | 5.25 | 9.00 | 5.25 | 9.80 |
| Carbon track potentiometers | 4.60 | 16.36 | 9.75 | 20.00 | 14.35 | 36.36 |
| Other resistors (including wirewound potentiometers) | - | 4.0 | - | 10.00 | - | 14.00 |
| Total | - | 43.29 | - | 45.60 | - | 88.89 |
| <u>Capacitors</u> | | | | | | |
| Plastic film capacitors | 49.27 | 54.88 | 25 | 7.70 | 74.27 | 62.58 |
| Aluminum electrolytic capacitors | 49.34 | 85.25 | 31 | 22.50 | 80.34 | 107.75 |
| Tantalum capacitors | 0.37 | 6.30 | - | - | 0.37 | 6.30 |
| Ceramic capacitors | 71.37 | 22.78 | 2 | 0.80 | 73.37 | 23.58 |
| Mica capacitors/silver mica plates | - | 17.00 | - | 22.30 | - | 39.30 |
| Gang condensers | 2.0 | 18.64 | 4.57 | 14.00 | 6.57 | 32.64 |
| Trimmers | 4.77 | 3.61 | 5 | 2.0 | 9.77 | 5.61 |
| Total | - | 208.46 | - | 69.30 | - | 277.76 |
| <u>Electromagnetic components</u> | | | | | | |
| Connectors | 0.64 | 32.00 | - | 15.00 | - | 47.00 |
| Relays | 1.07 | 25.57 | - | 9.00 | - | 34.57 |
| Switches | 0.28 | 30.70 | - | 34.00 | - | 64.70 |
| Other EM components | - | - | - | 9.50 | - | 9.50 |
| Total | - | 88.27 | - | 67.50 | - | 155.77 |
| <u>Other components</u> | | | | | | |
| Loudspeakers | 2.10 | 38.36 | 6.23 | 57.50 | 8.33 | 95.86 |
| Quartz crystals | 0.16 | 12.90 | - | - | 0.16 | 12.90 |
| Cast alloy magnets (million tons) | 166 | 48.52 | - | - | 166 | 48.52 |
| Hard ferrite magnets (") | 1,039 | 25.71 | 119. | 5.25 | 1.158 | 30.96 |
| Soft ferrites | 386 | 18.30 | 100 | 2.50 | 486 | 20.80 |
| Servo components | - | 6.20 | - | - | - | 6.20 |
| Magnetic tapes (MRM) | 298 | 20.23 | 86 | 3.30 | 384 | 23.54 |
| TV deflection components | - | - | - | 40.35 | - | 40.35 |
| TV tuners | - | - | 0.38 | 35.10 | 0.38 | 35.10 |
| Tape deck mechanisms | - | 1.0 | 0.33 | 51.00 | 0.33 | 52.00 |
| Printed circuit boards | - | 70.00 ^{a/} | - | 58.00 | - | 128.00 |
| Transformers and coils | - | 106.00 ^{a/} | - | -122.00 | - | 228.00 |
| Other components | - | -32.25 | - | -18.00 | 1 | 50.25 |
| Total | - | 379.47 | - | 393.00 | - | 772.47 |

Source: S.L. Sarnot, Electronics for you, (Annual Number 1983), New Delhi, India.
^{a/} Including in-house production for captive consumption.

3. POLICIES FOR SUBCONTRACTING AND COMPLEMENTATION LINKAGES

The above overview of the existing small-scale electronics industries in the various countries points to great differences in size, product scope and sales market outlets and importance for employment and value added of the companies. There are countries with a traditionally high participation of small-scale industries in manufacturing activities in general and in the electronics sector in particular, such as India and Indonesia which have developed schemes of protecting small-scale units against powerful large industrial operations. These schemes will be analyzed in following sections.

Other countries, like Singapore and the Republic of Korea are developing a new type of inter-industrial linkages along the lines observed in developed countries. This entails continuous technological innovation leading to a far reaching product specialization in the individual manufacturing unit. The competitive strength of the small-scale industries is here their high degree of detailed and specific engineering know-how reproduced in their production output. The production consists of parts and components which are relatively unique and can be so economically produced that they are purchased by larger industries under subcontracting schemes and incorporated into their final, technologically high complex products. Other small industries supply products which improve the production process of the larger companies or while complementing their production.

The following sections describe various examples of small industry promotion, and the impact of protection schemes on the development of small industry. These descriptions will be followed by a brief presentation of the institutional framework for assistance to and promotion of small-scale industries and of major constraints and problems affecting the electronics industry sector in general and the small-scale industry in particular.

3.1. The "foster-father" linkage scheme in Indonesia^{1/}

The Directorate General for Small Industry of the Ministry of Industry

^{1/} UNIDO: Assistance to the development of small industry in Indonesia, Joint project of Ministry of Industry and UNDP/UNIDO, project No. DP/78/078, Report No. 8, January 1983.

introduced in 1978 a new subcontracting scheme "Bapat Angkat" = foster-father to link small-scale industry to large purchasing companies. The scheme relies on the guiding and supporting role of a large (purchasing) company for a linked small-scale industry. The co-operation between the companies is based on contractual agreements and can englobe by, inter alia:

- supply of raw materials,
- supply of technical design,
- use of machinery, equipment, tools, jigs or fixtures,
- technical assistance and quality control,

The agreements may entail guaranteed prices and quantities and convenient payment schemes.

The subcontracted company agrees to deliver the contracted volume of production on agreed schedules with the stipulated quality features which might be controlled by the purchaser during or after production. The regional promotion and assistance offices of the Ministry of Industry, BIPK, normally countersign the agreements and support the establishment and expansion of foster-father linkages. Small units can also be organized in the form of co-operatives. The five sectors selected for the implementation of the foster-father scheme are the metal working industry and the leather and textiles, building materials, chemicals and food products industries.

The foster-father system appears quite adequate for rural and low technology small industry. The question arises whether such a scheme could also be usefully applied to high-technology areas, such as for maintenance of machinery and equipment through a small company, for software development in the case of computer industries or for specific applications in the case of measurement and control installations. The different requirements in these areas as compared to more traditional types of small-scale business may warrant a special approach.

The scheme and other such subcontracting schemes in Indonesia as well is still constrained affected, by various factors. In order to encounter these factors the following measures can be suggested:^{1/}

1/ UNIDO, Assistance..... ibid.

- exemption from sales tax for the subcontracted production volume;
- free inter-factory transactions of materials and production requirements;
- tax rebates for technical assistance, training and other production support expenditures incurred by the "father" unit.

3.2. The system of ancillary industries in India^{1/}

With the building-up of an industrial basis, especially in heavy industries, local production of spare parts became a fundamental requirement in India. This task was taken over by a few small-scale industries which soon were named 'ancillaries' to the large industrial units.

Soon after formalizing the role of these small-scale shops attached to large companies through the authorities, Ancillary Committees on Plan Level and State Level were created and the once more or less sporadic creation of ancillaries was introduced into industrial planning and became subject of special promotional efforts. Today the definition of ancillaries is

"an undertaking having investment in fixed asset in:

- (a) the manufacture of parts, components, sub-assemblies, tooling or intermediaries; or
- (b) the rendering of services,

supplying or rendering or proposing supply or rendering 50 per cent of their production or the total services as the case may be to other units for production of other articles; provided that no such undertakings shall be a subsidiary of, or owned or controlled by any other undertakings."^{2/}

In order to support the growth and development of ancillary industries the Bureau of Public Enterprises published in 1978 guidelines covering conditions, process of setting up of ancils, monitoring their function, periodic review, interaction between parent unit and ancillary unit regarding flow of

^{1/} See further "Mechanisms for small-scale industry development: Ancillarization - development of feeder industries" (forthcoming). Regional and Country Studies Branch, UNIDO.

^{2/} V. Rama Rao, Ancillary development in Electronics Corporation of India Ltd., March 1984.

information, etc. The technical status of ancillary compared to small-scale enterprises in general can be summarized as follows:

- provision of technical know-how and managerial guidance;
- supply of critical imported raw materials or components where necessary;
- as far as possible guaranteed off take of 50 per cent of the production of the ancillary units; and
- prices to be fixed allowing for reasonable margin on capital employed.^{1/}

The contracts between parent company and ancillary unit are normally long-term agreements, covering, for instance, five years. Subject of subcontracting are normally items of a relatively low technological complexity. "Concentration of in-house manufacture (i.e. in the parent company) is generally for critical/functional and higher technology items. Other items are identified for subcontracting. Utilization of existing in-house capacity is, however, ensured before deciding on off loading of jobs."^{2/} Even though apparently only low technology items are subcontracted to ancillaries, the quality control requirements and the amount of technical assistance provided to the ancillary units are substantial. The difficulty of keeping the ancillarization in a period of rapid technological innovation can be mentioned. A change from electro-mechanical telecommunication switching equipment which was partly contracted out to ancillary units to digital exchanges which technologically gave no possibility for subcontracting, endangered the linkages with ancillary units.^{3/}

Due to the protection of the ancillary as far as purchasing obligation by the parent company is concerned, marketing or product development activities of the small-scale unit usually do not develop. The ancillary thus remains completely dependent on the parent company and is unprepared for technological change or other reasons for sudden reduction in demand for their products.

^{1/} V. Rama Rao, op.cit.

^{2/} B. M. Ravikumar, Technology transfer - BEL's experience (BEL's Bharat Electronics Ltd.), March 1984.

^{3/} V. Rama Rao, op.cit.

The promotion of ancillaries would need to sufficiently take this issue into consideration in view of the dynamic processes in the industrial environment which at present are illustrated by rapid technological innovation in the electronics industries and related electrical and electro-mechanical areas. Technological innovation should thus be incorporated into the scheme of ancillary industries.

The experiences reported so far indicate that rigid ancillarization systems are hardly appropriate measures for developing linkages in the electronics field. Indeed, examples of well functioning ancillarization schemes in production sectors with rapid technological change are scarce.

3.3 The systematization of inter-industrial co-operation in the Republic of Korea

The Small Business Systematization Promotion Act (established in 1975) "aims to protect the interests of the small business as subcontractor from large scale enterprises. It mandates, for example, that the Government prevents a delay in payment by a large scale firm to its subcontracted small-scale enterprise."^{1/} The systematization project intends to foster the specialization of the subcontracting small-scale enterprise in the production of components and parts which will be assembled by the large company into the final product. Unlike the Indonesian and Indian examples, the social welfare aspects are less accentuated while more importance is given to the technological innovation and production specialization processes for which technical, promotional and financial assistance is granted by public institutions and programmes.

The intended effects of the system on the purchasing company are

- prevention of double investment;
- reduction of production cost;
- guarantee of quality;
- stabilized supply of parts;

^{1/} Status of the Korean Small Business, 1983, Korean Federation of Small Business.

and on the part of the subcontracting small-scale industry

- growth on the continued basis;
- termination of dispute between the large and small enterprises;
- establishment of supply order.^{1/}

The system is supported by credit and tax rebate schemes. The small business fund gives financial support for new facilities, for operations and for sales financing, the small industries furthermore have access to credit guarantees and to the activation of negotiable bills. Tax rebates include reduction of tax payments by 10 per cent of investment for local and 8 per cent of investment for imported machinery and equipment for laboratory and inspection purposes, and acceptance of technical guidance expenses as a pecuniary loss.

The inter-industrial linkages are institutionalized in the "Systematization Promotion Council" which is established in the Korean Federation of Small Business and which

- "- co-ordinates disputes between purchasing and subcontracting enterprises;
- examines business transactions quarterly and takes necessary steps;
- digs out problems for systematization";

and in a special council for the small industry has the objective, inter alia, to foster joint development of parts.

The results since the practical start-up date of the system in 1979, have been impressive (Table 7). In four years the number of products

Table 7. Republic of Korea: Result of the systematization efforts

| | 1979 | 1980 | 1981 | 1982 |
|--------------------------|------|------|-------|-------|
| Subsector | 5 | 6 | 24 | 34 |
| Products | 41 | 71 | 426 | 1,038 |
| Purchasing companies | 37 | 64 | 220 | 345 |
| Subcontracting companies | 157 | 263 | 1,141 | 1,940 |

Source: Korean Federation of Small Business, op.cit., p.23.

1/ Op.Cit.

increased 25 times the purchasing companies by a factor of 9 times and the subcontracting companies 12. This means that a highly growing number of purchasing companies concluded subcontracting agreements with an even stronger growing number of small-scale enterprises offering more products than before. While in 1979 157 companies were able to sell 41 products, i.e. in average 3.8 companies per product, this figure changed to 1,038 products sold by 1,940 companies, which gives a ratio of approximately 1.9 companies per product.

The system has been functioning satisfactorily and, will, according to information obtained during field work, be extended in the coming years.

3.4 Product reservation schemes

India, Indonesia and the Republic of Korea have established Product Reservation Schemes. In Indonesia, 127 products are reserved for small industry since 1983, in India the number of products is 834. In the Republic of Korea the reserved product scheme forms part of the "Systematization Promotion Act", which foresees a continuous extension of the subsectors and products reserved for small- and medium-sized industries. In 1983 43 subsectors with 1,445 products were covered; planned coverage is a total of 103 subsectors.

The product reservation scheme in India covers approximately one third of the production of small industry. As regard electronic industries, only repair services of radios and television sets are reserved for small industries. India introduced the first product reservations in the 1960s. In 1977 the Indian Government issued the "New Industrial Policy Statement" which set forth "that whatever can be produced by small and cottage industries, must only be so produced However, it must also be ensured that production is economic and of acceptable quality."^{1/} Included in the product list are 89 electrical and 22 electronic items including TV tuners and TV games.

The report quoted further explains:

^{1/} Quoted by Ram K. Vepa in report No.38, December 1983, of joint project of Ministry of Industry UNDP/UNIDO on Assistance to the Development of Small Industry in Indonesia, project No. DP/INS/78/078.

"It may also be mentioned that any additions (in the 6 years since the list of enlarged, only 18 additions and three deletions have been done) to the list are carefully examined by a high-level committee consisting of several agencies and ministries from various aspects to technology, production, quality, pricing, marketing etc. There must be demonstrated a proven capability of the small sector to produce and sell quality goods. In fact, in a majority of cases, the scheme merely formalises the actual situation that the small sectors has already achieved a significant share of the production. Hence, the scheme provides protection in areas where the small units have been operating with success for some years. In fact, in a study undertaken a few years back, about 40 items were identified as being in a truly competitive situation between the large and small sectors.

The Product Reservation Scheme does not provide that large and medium industrial units producing the item should cease such production. Nor was it stipulated that they phase out the production over a period of time. The restriction imposed was to freeze their production capacity at the level it had at the time of reservation; and any further increase could be done only in non-reserved items. They were encouraged to seek other areas of diversification for maintaining their growth. Since, the production of the large and medium units is monitored every quarter, it is easy to detect any deliberate violation of the policy; in practice, there were hardly any.

The progress of the scheme is continually monitored by a high level committee of secretaries to the Government of India (who are the executive heads of their respective ministries) which meet about once in two months to:

- review the production of reserved items;
- consider any additions or deletions proposed;
- provide clarifications to the terminology used in the scheme;
- suggest policy support required by the small units to make the scheme effective.

With increasing cost of machinery and raw materials, some of the units producing reserved items have gone beyond the investment ceiling prescribed for the sector. In 1980, the investment ceiling was doubled to take care of increased costs to about \$200,000, but the problem of units which had ceased to be small but which continued to produce items which are reserved became somewhat ticklish administratively. While diversification is a possible solution, it was not always feasible. It has been therefore suggested that the policy of reservation may exclude such units and they may be allowed to continue the production of the items.

It is important to emphasise that the policy of product reservation, by itself, cannot produce a radical change unless it is accompanied by other policy measures such as availability of credit - both for capital assets and working capital - easy supply of raw materials at reasonable prices, marketing assistance such as preferential purchase, technology support in regard to new designs and processes. Unless, an integrated 'package of assistance' is developed to support the scheme of product reservation, it is not likely to provide any appreciable benefit to the small units.

The Indian experience clearly demonstrates the feasibility of working a Product Reservation Scheme but also highlights the problems that are involved in it - the need for a careful indication of the products, the demonstration of proven capability by the small units, the need for a package of assistance in various aspects, and the close monitoring of the scheme to achieve the results intended. These aspects need to be paid careful attention to if the scheme is to operate successfully."

3.5 Institutional framework in Indonesia and the Republic of Korea

(a) Indonesia

Promotion of and assistance to small-scale industry is organized around the Directorate General of Small Industry (DGSII) in the Ministry of Industry. Part of the related credit programmes, for investment (KIK-programme) and for working capital (KMKP-programme) is handled through the banking sector. The main objective of these credit programmes are employment creation, development of entrepreneurship, production promotion, local market development and geographic dispersion of investment.

The DGSII, is divided into six directorates, namely programme and development, foods industry, leather and textile industry, building material, chemical and metalworking industry. At the provincial level, there are 26 offices of industry (KANWIL), centralized in one additional office in Jakarta. These offices also implement programmes of the national and provincial governments.

One of these programmes, and by far the most important one for the small-scale industries, is operated under the name of BIPIK (Bimbingan dan Pengembangan Industri Kecil). BIPIK is a multi-faceted programme giving support in technology, training, credit and marketing. The activities of BIPIK normally include extension services, management and technical training, marketing assistance, raw material supply, quality control and standardization and surveys.

Recently, the BIPIK programme has been made a permanent feature of the Indonesian development programme connected to the provincial industrial offices KANWIL. The programme is mainly conducted through

- regional development centres (PPIK's);
- service and demonstration centres; and
- centres of entrepreneurial education and training.

BIPIKs normally have a sectoral and an infrastructural directorate and, if established, a regional development centre on the same directorate level. A co-ordination unit actively intervenes, among other activities, in the establishment of rural mini-industrial estates or industrial clusters.

The DCSI takes an active role in assisting and monitoring all support activities to the small-scale industry. It also activates the technical and technological assistance of research and development institutes such as the Metal Industry Development Centre, and the Institute of Technology both located in Bandung. However, the assistance and promotion programmes offered through BIPIK and other programmes focus mainly on traditional small-scale industry and are primarily geared to stabilizing the rural employment situation in times when most of the traditional small-scale industries are affected by sluggish market development of their products, partly due to uncompetitive prices, qualities or changes in consumer behaviour, leading to growing pressure on the employment.

(b) Republic of Korea

In the Republic of Korea several laws regulate the small industry and development:

- Small Business Co-ordination Act (1961)
- Small Business Co-ordinative Act (1961)
- Citizens National Bank Act (1962)
- Small Business Basic Act (1966)
- Small and Medium Bank Act (1974)
- Credit Guarantee Fund Act (1974)
- Small Business Systematization Promotion Act (1975)
- Small Business Promotion Act (1978)
- Small Business Product Procurement Act (1981).

In 1982 the legal structure related to small industry was amended and streamlined to suit present needs. The corresponding implementation decrees

were also revised. While in the past policy measures were mainly directed towards development of large-scale industries in order to establish an industrial base, increasing attention has recently been paid to the small-scale sector as a means to diversify and complement the productive structure of the country and to activate additional economic forces for sustained growth. The major topic under which these measures and programmes are implemented is technological advancement. The main policy directions for improvement of small industry's economic contribution have been formulated as follows:^{1/}

- Improvement of competitiveness
 - identification and development of small and medium industries with high growth potential;
 - special programmes to improve product quality;
 - expansion of co-operative programmes.
- Expansion of industrial base
 - development of parts and components production programmes;
 - strengthening of the systematization of subcontracting;
 - strengthening of support systems for small industry.
- Promotion of internationalization;
 - increase of exports contribution;
 - strengthening of international co-operation;
 - improvement of industrial design.
- Promotion of technical innovation capability
 - increased support for technology development and commercial application of new technologies;
 - increase of guidance and training programmes;
- Stabilization of business prospects
 - strengthening of functions of co-operative associations;
 - encouragement of business adjustment and mutual assistance programmes;

^{1/} Government's Small and Medium Industry Promotion Policies, 1984, Ministry of Trade and Industry.

- promotion of regional dissemination of industries.
- Increase in investments and simultaneous tax rebates
 - financial assistance;
 - financial support;
 - tax incentives.

In addition, banks have been induced by the Government to substantially increase their lendings to small industry and to raise the credit share of the sector to 35 per cent of total industrial lendings.

The Government has established a long-term plan to develop the small industry sector. This plan aims to increase value added by 9.4 per cent, employment by 6.6 per cent and export-aimed production by 12.5 per cent annually (Table 8).

Table 8. Key targets of the Korean long-term plan for
small industry development
(in per cent)

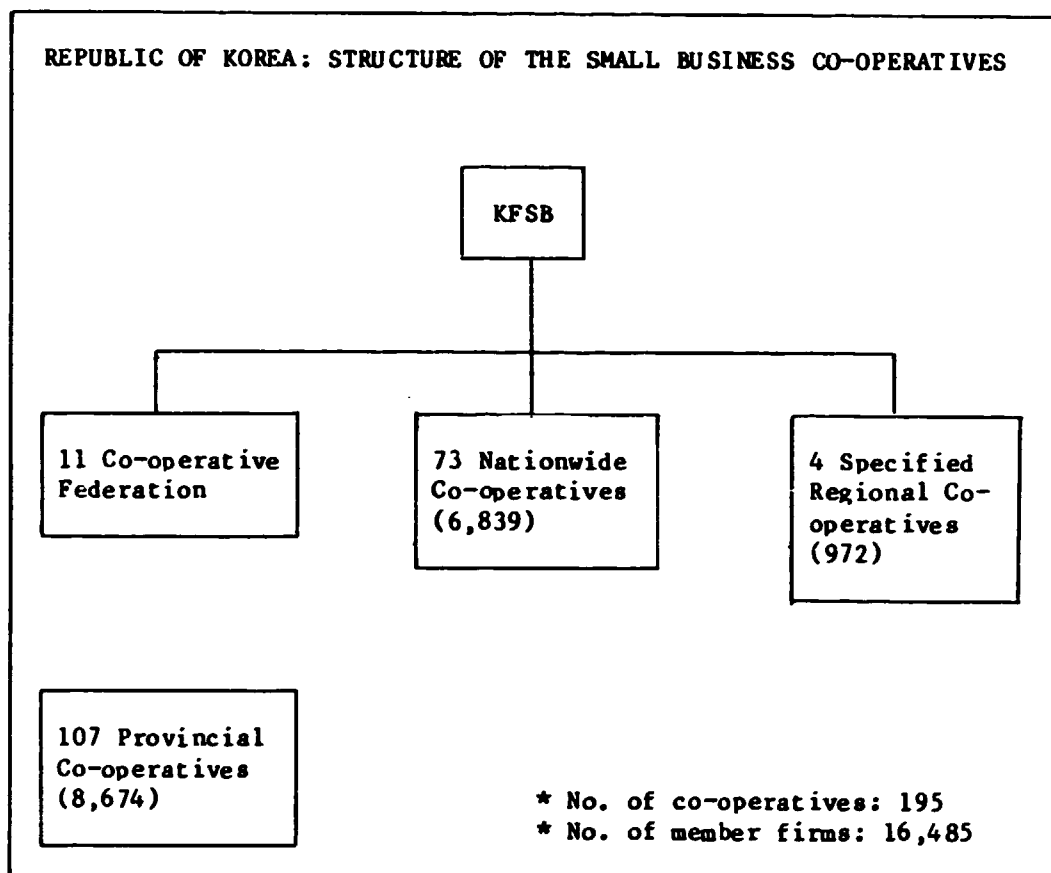
| Small industry's share in | 1981 | 1991 | Annual increase |
|------------------------------|------|------|-----------------|
| Value added | 35.4 | 44.8 | 9.4 |
| Employment | 47.7 | 54.3 | 6.6 |
| Export-aimed production | 56.4 | 68.9 | 12.5 |

Source: The Republic of Korea Federation of Small Business

There is also a great number of specific programmes for promotion of and technical assistance to the country's small industry sector. Thus, the Korea Federation of Small Business (KFSB), incorporates in its programme (i) a self-help character through active participation of its members and (ii) a budget contribution by the Government to the institution without direct control over the allocations by authorities.

In view of its special features, it would seem to be of value to describe the Korea Federation of Small Business (KFSB) in some detail.

The Federation was established in 1962 as a co-operative federation to improve the status and protect the rights of the small business. Small enterprises are indirect members through co-operative federations by industry sector, nationwide co-operatives and provincial co-operatives are members also by industry and there are also specified regional co-operatives. Approximately 50 per cent of small enterprises are members in these co-operatives. The Federation is administered by a president, an executive vice-president and three executive directors responsible for a total of nine departments. Total staff of KFSB which also runs nine branch offices in the country amounts to 200 employees.



Source: Korea Federation of Small Business, November 1973.

The annual budget of KFSB was raised from US \$6.9 million in 1983 to US \$14.8 million in 1984 of which in 1983 42 per cent was covered by member contributions and 58 per cent by Government subsidy.

The major activities of KFSB are

- investigation and research;
- guidance of the member co-operatives;
- international co-operation and trade promotion;
- training and education;
- publication.

The activities of KFSB include

- the elaboration of policy recommendations to the Government affecting small industry: in 1983 a total of 303 suggestions were submitted to the government (96 related to finance and taxation, 48 related to trade, and 159 related to policy measures) of which 172 cases were adopted;
- annual surveys of the state of small industry, quarterly reviews on management conditions and forecasts of business development and monthly reports on production and operation activities rounded up by occasional publications on specific items such as manpower conditions, technology and production facilities;
- suggestions on improvement of foreign trade systems and participation in international fairs abroad and in Korea;
- trade, technology transfer and joint venture promotion missions, e.g. to USA, Japan and Federal Republic of Germany;
- support to small business in the implementation of the systematization plan (subcontracting linkages);
- support of joint purchases and sales of member companies, financed through the Small and Medium Industry Bank (volume in 1983: US \$967 million);
- support to collective contracts of small industries for government purchases (contract volume in 1983: US \$533 million), financed by the Small and Medium Industry Bank through KFSB;
- operation of the technical research and development co-operative system under the technical development promotion act as an instrument of technical development of small industry;
- execution of educational and training programmes on management and technical topics (e.g. quality control, introduction of EDP, taxation and trade);
- business assistance through the KFSB consultation office.

Besides this, advice is given to member companies on the appropriate utilization of other promotional (financial, technical and manpower training) facilities in the country. Among the members of KFSB are the Republic of Korea Computer Co-operative, the the Republic of Korea Electric Wire Co-operative, the Republic of Korea Electrical Industry Co-operative, the Korea Electronic Industry Co-operative and the Korea Telecommunication Industry Co-operative. KFSB has apparently a major impact on the development of small industry in the Republic of Korea which merits a detailed analysis and discussion, especially as relates to transferability to other developing countries in the Asia and the Pacific region.

3.6 Some problems and constraints encountered by small-scale industries in the electronics sector

The inadequacies and constraints affecting the electronics industry sector have been described in ESCAP's 1981 sectoral analysis covering various developing countries in Asia and the Pacific region.^{1/} Problems and constraints of the electronics sector industries as reflected in that report are summarized below by country.

Bangladesh

The main problems affecting the electronic sectors' growth are:

- Frequent changes in duties/tax structure prevents advance planning of production;
- Imports of fully assembled radio and television sets retards development of indigenous production;
- High duties on wires, fibres, core materials, plastics dissuades indigenous component manufacture;
- Multi-agency sanctioning procedures for industry are lengthy and time-consuming;
- Price controls by Government have an adverse effect on development of production;
- Skilled manpower has migrated to Middle East countries, leading to local shortages of trained personnel;
- Limitation of foreign exchange allocations to production units prevents expansion of production;
- Import duties on finished products are low and those on raw materials high. This inverted tariff structure dissuades indigenous production;
- Labour problems have had an adverse effect on the productivity of labour;
- Lack of professional management and technological know-how have hindered the expansion and diversification of the electronics industry;
- Low labour efficiency, cumbersome industrial sanctioning procedures and the inadequacy of the economic infrastructure and other factors have

^{1/} ESCAP, Regional study of the electronics industry (Bangladesh, Malaysia, Pakistan, Singapore, Sri Lanka and Thailand), August 1981.

dissuaded export-oriented foreign investment in the export processing zone;

- There are no plastic injection moulding facilities for the production of cabinets for radio and television sets.

Pakistan

The main development problems related to the electronics sector are:

- Liberalization of imports of radio parts and components under commercial license has unbalanced the organized sector of the electronics industry, leading to the closure of radio assembly in the organized sector due to the mushrooming of unauthorized assemblers;
- Fiscal anomalies inhibit indigenous manufacture of components;
- Lack of design and development facilities in the country;
- Proliferation of makes and models and lack of standardization, makes indigenous production uneconomical;
- Small quantity purchase of components leads to price mark-up and increased production cost;
- Exodus of skilled persons to other countries and the brain drain to advanced countries creates shortages of indigenous skills;
- Prohibitive tariff structure on electronic components and relatively easier terms for finished equipment inhibit indigenous production;
- Low labour efficiency leads to erosion of profitability.

Sri Lanka

The following constraints affecting the electronics industry are mentioned:

- The duty and tax structure is not conducive to indigenous production;
- There is no articulate and consistent development policy for electronics;
- The opening up of the imports of radio and television sets has hampered indigenous production;
- Inadequacy of management skills;
- Inadequacy of job-oriented skills for application to the electronics industry;

- Prohibition of new industries within the municipal limits of Colombo;
- Inadequacy of electric power;
- Limited size of domestic market and the extreme competitiveness of the export market;
- Lack of qualified teachers and training aids in the technical training institutions.

Thailand

The problems affecting the electronics sector's growth are as follows:

- The TNCs operating in the country enjoy fiscal and technology advantages not available to the local firms, e.g. low-priced kits imported from home factories and a favourable taxation structure for import of kits. On the other hand local products are subjected to double taxation;
- Imported equipment generally has a low rate of duty, whereas imported components are taxed at a higher rate. This inverted tax structure inhibits indigenous production, particularly of professional electronics equipment;
- Import procedure is slow and aggravated by cumbersome and time-consuming customs procedures in the clearance of goods;
- Turn around time of imported components is long;
- In Government contracts the local firms have to compete in price and quality with established foreign firms who enjoy advantages of technology and economies of scale;
- The demand of professional electronic equipment is very small, making it uneconomical to produce locally;
- Subcontracting is not possible because of uncertainties of quality and punctuality of delivery;
- Industrial sanctioning procedures are lengthy and entrepreneurs have to deal with a number of organizations (up to 15);
- Radio communication is restricted by strict licensing procedures and Government monopoly, inhibiting indigenous production of radio transceivers.

These references to inadequacies and constraints affecting the sector drawn from the ESCAP report largely correspond to observations made during the field work made for this study. The next chapter will deal with the potential of policy measures to foster development of small-scale electronics

enterprises through inter-industrial linkage improvements and will indicate how much of those problems can be eliminated or neutralized through new approaches to industrial promotion by the main actors involved (government, support institutions, banks and large and small industries).

4. POLICY MEASURES TO FOSTER INTER-INDUSTRIAL LINKAGES IN THE ELECTRONICS FIELD

4.1 Some basic trends

In the previous chapters the great difference was shown between selected developing countries of Asia and the Pacific region, in terms of the overall importance of the small-scale electronics industry and the institutional set-up for its promotion. Given these differences it is nevertheless important to reiterate some of the more prominent examples of policies for the promotion of small-scale industries in the electronics sector and to attempt to outline trends of general validity. As can be seen from the industrial development history of industrialized and of more advanced developing countries, the future role of small-scale engineering industry will most certainly lie primarily in the production of parts and components. This could suggest that emphasis needs to be given to such policy measures which are most adequate for fostering inter-industrial linkages in form of subcontracting and complementation in the electronics sector.

The main objective of introducing additional policies in a country should not be to protect and maybe over-protect small-scale electronics industries but to strengthen their internal resources and their capacities to grow into new technological areas. In this context, distinction will have to be made between 'traditional' and 'modern' small-scale industry; owing to their different backgrounds the two types of enterprises will require varied promotional approaches. While the first type will primarily need technical assistance to improve its economic and technical status, the second type requires mainly preinvestment guidance, assistance in human resources development and venture capital supply. It can be assumed that 'modern' small-scale enterprises are able to solve their business problems either by their own or by addressing themselves to the right sources for the solution (e.g. market research agencies, technology transfer sources, labour training institutions). Their main requirements will most certainly be in the areas of

- human resources development;
- creation of appropriate business environment;
- support activities for business development;
- access to information on technological advancement; and

- legal framework and public incentives for promotion of subcontracting and complementation linkages.

The fundamental question to be asked is whether electronics component production is an area for complementation by small-scale industries. To answer this question reference can be made to the traditional electronics component production in small-scale industries in India. For many years India has promoted the production of components in small-scale enterprises. While this domestic policy was pursued, the international scene changed - due to new automated production processes and new generations of electronics components towards more capital intensive and quality safeguarding production outlays. This led to the fact that in the early 1980s the Indian production capacities had remained in size only a fraction of international capacities, as shown in Table 9.

Table 9. Comparison of scale factors in producing electronic components

| Components | Scale (in million nos) | |
|--|------------------------|--------------------|
| | Local unit in India | International unit |
| 1. Integrated circuits | | |
| (i) Digital | 1.0 | 50.0 |
| (ii) Linear | 0.5 | 5.0 |
| 2. Transistors and diodes (small signal) | 20.0 | 500.0 |
| 3. Power transistors | 0.2 | 3.0 |
| 4. TV picture tubes | 0.1 | 1.5 |
| 5. Electrolytic capacitors | 10.0 | 100.0 |
| 6. Ceramic capacitors | 50.0 | 50.0 |
| 7. Plastic film capacitors | 10.0 | 50.0 |
| 8. Carbon film resistors | 50.0 | 1,000.0 |
| 9. Switches | 0.2 | 2.0 |
| 10. Relays | 0.2 | 2.0 |
| 11. Reed switches | 3.0 | 20.0 |

Source: S.L. Sarnot, "Electronics for you", Annual Number 1983 New Delhi, quoted by Morehouse and Chopra, op.cit.

Indian component technology development could, whether due to scattered production, over-production of industries or other factors is not known, not keep pace with international development. With growing concern in the country about this increasing technology gap the Department of Electronics (DOE)

realized that changes in industrial policy are required and more capital intensive, large scale production units were required and published the following note:^{1/}

"Note on DOE^{2/} policy regarding electronics components industry

Plentiful availability of the numerous varieties of electronics components freely and at reasonable prices in India is considered to be the basic pre-requisite for giving a boost to the production of electronic equipments and systems. Hence, Department of Electronics has decided on the approach outlined below for the development of electronic components industry:

1. Promoting/licensing/establishing components manufacture on a large and viable basis with a broad entrepreneur base would mean production somewhat in excess of purely domestic requirements. However, when the industry is grown on an internationally viable basis, immense export opportunities would be available.
2. Large capacities are required for economic viability on international scale as well as for ensuring product quality. This is technological compulsion due to the advent of automatic machinery. Accordingly the existing organized sector industries are encouraged to grow freely.
3. Looking to the demand position and the gestation periods, it is unlikely that the existing units would be able to meet the demand without substantial expansion and modernization. Therefore, fresh capacity creation is considered necessary. The capacity is being promoted only on an internationally viable basis. We take into account the domestic demand as also the export opportunities while examining the costs and technologies in any proposal.
4. Regarding foreign technology, Department of Electronics policy is to freely allow technology import in areas of modern types of components. There are inadequacies in technology with the existing manufacturers and very few approvals have been obtained for defence quality components.
5. Lower utilization of capacities observed in some cases now, have been for reasons other than the demand constraints (generally managerial failures).
6. For the above reasons, components are unsuitable for production in the small-scale sector and both Department of Electronics and DCSSI have been writing to all small-scale entrepreneurs for the past

^{1/} Government of India, Department of Electronics, Electronics in India and Comparison with Electronics in South Korea, Taiwan, Singapore and Hong Kong, New Delhi, The Department, November 1982, quoted by Morehouse and Chopra, p.26-27.

^{2/} Department of Electronics, Government of India.

four/five years that it would be unwise to invest in components manufacture in the small-scale sector and they would do so at their own risk since the Government may not be prepared to give protection".

This drastic change in industrial policy clearly indicates that an area which once was a stronghold for small-scale, specialized production, also in industrialized countries, had to give way to innovative production technologies as well as innovative component developments increasing their versatility in applications.

Similar developments can be noticed in other areas of the electrical/electronics industries be it in production or application, such as the change from analogous to digital control devices which completely altered the production pattern. This process has mainly affected the more advanced countries and has led in many cases to a switch from applying control devices using power semiconductors to those based on electronics components.

The rapid innovative changes require a high degree of production flexibility based on continuous adaptation of new technological development which, ultimately, requires well trained, experienced and innovative engineering staff even in small-scale industries.

The newest generation of highly automated semiconductor production installations, at present under construction in Japan, the Republic of Korea and USA as successors to production units for very large scale integrated circuits, indicate that the future major role in production of components may be, due to investment volume involved, a domain of large industry.

4.2 New areas of subcontracting and complementation

So far developing countries in Asia and the Pacific region have given most attention to the production of components and complete equipment.

These products are now becoming less and less eligible for production in small enterprises because of changes in production technologies leading to different economies of scale, product development cost or cost of marketing of the products. Several countries have consequently promoted the specialization

of small industry in high technology parts production, e.g. computer disk drives production. Small enterprises in the Republic of Korea and Singapore have taken up such production for supply to large industries.

As is illustrated by recent development in industrialized countries, the growing production integration of electronic products leads to a gradual reduction in the scope for "traditional" subcontracting. Complementation seems to become more and more important for small-scale industry and its linkage to large-scale enterprises. Complementation products are, for example, computer peripheral equipment, industrial process control equipment, electronic control devices for the automotive industry and electric motor control devices. There are changes in product structure in subcontracting and complementation; engineering work is placed in the foreground and all product development and construction efforts are achieved through enterprise specialization. Even though the enterprises are highly specialized they assign great importance to product and customer diversification so as to limit dependencies.

The shift of small industries into specialization in high technology areas can on the other hand not be seen as a long-term 'security' for business success. Continuous adaptation to new developments is a fundamental requirement for the enterprises in this field. Indeed, technological change has to be seen both as a potential motor as well as an obstacle to subcontracting and complementation. This can best be illustrated by the instrumentation and control equipment subsector. While many control processes traditionally were based on electro-mechanic systems which allowed decentralized production in specialized small enterprises, the change to electronic control devices reduced the subcontracting potential considerably as production became based on integrated processes. The same development can be observed in the telecommunication subsector.

Other fields with growing potential for subcontracting and complementation are the application of electronics and service functions. Experience in industrialized countries shows their importance of this type of business for the development of small industry. These areas have, however, not yet received the attention by policy makers and industrial promotion agencies in the developing countries in Asia and the Pacific region they deserve.

The application area includes systems engineering, process control engineering, computer aided design and computer aided manufacturing (CAD/CAM-systems) and computer software generation. The typical entrepreneurs entering into these areas in industrialized countries are young, highly educated professionals with three to ten years relevant experience mostly in larger companies. In their professional experience they usually have specialized in an area of technology which later will be the base for their entrepreneurial activity.

A growing number of small industries in industrialized countries take up specialized service functions, such as machinery and equipment servicing and maintenance, engineering services and software adjustments and education and training programmes. Partly, these activities are carried out under contracts with equipment suppliers (e.g. regionally limited service contracts) or under contractual arrangements with the user of equipment. In both cases the enterprise will have to obtain the confidence of the contract partner through high quality of workmanship and prompt performance. The typical entrepreneur entering these areas has similar characteristics.

4.3 Government purchasing as policy instrument to foster subcontracting and complementation

Several countries have introduced schemes to assure that small industries participate in purchases of the public sector. In the Republic of Korea, for example, the KFSB can conclude delivery contracts with public or private agencies and subcontract the promotion of the products to its member companies.

Ram K. Vepa describes the Government purchasing policy in the USA as follows:^{1/}

The USA has paid particular attention to the share of the small business sector in the Government programme. In fact the Small Business Act (1953) under which the assistance to small business was undertaken, lists as an important function of the agency - Small Business Administration (SBA) - "to ensure that a fair portion of the total purchase and contracts for property and services for the government be placed with small business enterprises". The code of federal regulation stipulates that "small business concerns shall be afforded an equitable

^{1/} Vepa, Ram. K., op.cit. (report No.38).

opportunity to compete for prime contracts and subcontracts"; but the SBA has no specific authority to insist that federal government departments and agencies do purchase their requirements from small business. Even so, the proportion of procurements of the federal government from small business had gone up to 35 per cent which is certainly an impressive figure.

This is achieved through a large number of procurement centres with representatives of the SBA assigned to civilian and defence departments throughout the country. The departments are chosen from the view point of their importance to small business. The basic function of the representative is to see in what manner small business can participate in the procurement programme of the government agencies. The programme is done in three ways: (i) to separate the general services from the overall contract; (ii) to break up a large purchasing programme units into simpler components, many of whom will fall within the capacity of small business; and (iii) to break a large volume order into small lots that can be executed by small units.

The SBA also provides the certificate of competency to testify to the capacity of small firms to be able to execute a government contract. The SBA personnel visit the company, make an on-the-spot assessment and issue the competency certificate. Contracts are awarded on the basis of such certificates or on the basis of information provided by SBA even without a formal certificate.

In 1971, Congress passed a law (PL-87-305) which required that in all contracts over US \$500,000 it is mandatory on the part of a 'prime' contractor to designate a small business liaison officer, offer small business an opportunity for subcontracting, and maintain detailed records for all subcontracts over US \$10,000. A voluntary subcontracting programme for private firms is also encouraged. Thus the SBA encourages the increasing participation of small business - both as prime contractors and as subcontractors; the figure of such participation has varied between 35 and 45 per cent - and in absolute terms, amounts to a considerable business since the total procurement by federal agencies is of the order of US \$50 billion.

4.4 Key elements of a promotional policy

On the basis of observations of past and current trends and policies relating to the electronics industry in general and to the linkages between this sector and the broad engineering industry sector in particular, some basic policy requirements can be singled out.

A first requirement concerns human resources development. High grade technical education on a relatively broad scale is a basic precondition for taking up production of advanced technology equipment or for software generation and engineering services. For establishing and operating

a large-scale electronics industry requirements for human skills will be high. Additional professionals will then be needed in research, education and training and for the creation of small industries.

The Republic of Korea has been successfully pursuing educational policies towards this end. For the production of electronic components the country has to its disposal a relatively great number of Korean students and young professionals. While the country was expanding its educational capacities at home, it used simultaneously the possibility of having students trained in universities and research centres abroad.

Scientific and technological capacity a second fundamental asset for fostering electronics industries.

Research and development expenditure in most developing countries in Asia and the Pacific region as percentage of gross domestic product is still very low. Whereas Thailand in 1980 had a share of 0.24 per cent the figures for USA and Japan were 3.1 per cent and 1.5 per cent respectively. The research facilities existing in the ESCAP region are mostly insufficiently equipped to fulfill present requirements. An exception is probably India which has a great number of well staffed research centres. However, in spite of this basic availability of research institutes India could not keep pace with international development in the electronics sector. This shows the complexity inherent in such a technologically dynamic sector.

It can be concluded that research and development activities in the developing countries in Asia and the Pacific region need to be closely related to the specific development potential of their electronics industry. Therefore, it seems appropriate to pay major attention to basic research and component development, like integrated circuits at the present stage of technology. Focusing research and development activities on application areas will be directly beneficial to increasing the product scope or service functions which could be taken up by small-scale industry.

A third requirement is the access to technology. Continuous technological innovation in enterprises requires access to up-to-date information and technology. Experience shows that lack of such access is a major constraint

to small-scale industry development. Specific programmes and institutional measures are therefore needed. Research institutes, small industry promotion agencies and self-help organizations and specialized libraries are indicative institutions to build up a technology data bank and to link up with similar international institutions. Here again, special attention should be paid to application areas and service functions.

A fourth key requirement is the prevalence of standardization and quality control. Appropriate policies would need to be conceived to this end. Also, the active role of an industrial association in furthering standardization of products and increasing quality control can be successful. This can, for example, be demonstrated in the case of Singapore where companies submit to quality standards of electronics products established by their association.

Fifth, technical and financial assistance should be an important part of any policy package. The small industry sector requires special technical, economic and financial assistance. For being able to conceive and render assistance to the electronics industry it is essential that the promotion and lending agencies have a good understanding of the relevant technologies. Development banks would need to be ready to enter into venture capital financing. The Republic of Korea is presently starting such activities and these experiences may be of general interest to other developing countries in Asia and the Pacific region.

A sixth important measure is Government purchasing. Experiences gained in industrialized countries and some Asian developing countries in fostering subcontracting through Government purchasing policies show that such policies could be beneficiarily applied in the developing countries in Asia and the Pacific region. Government policies should include the possibility to grant special contracts to newly created high technology small industries to increase their business volume in the difficult start-up phase. The Directorate General of Small Industry in Indonesia has gained some promising experiences with such activities.

Seventh, the fostering of subcontracting and complementation linkages will require special supporting policy measures as experience in industrialized and some Asian developing countries shows. Among those measures should be

- fiscal incentives (instead of tax barriers) for subcontracting and complementation business;
- incentives to large industry to subcontract (tax incentives, deductability of subcontracting planning and technical assistance cost, financing schemes for subcontracting and complementation business etc.);
- investment incentives;
- establishment of a legal framework for subcontracting and complementation;
- industrial land and building facilities;
- training courses;
- market studies and business potential surveys;
- export potential analyses and export promotion.

The enlargement of policy measures to foster inter-industrial linkages will consequently lead to a more diversified industrial production structure. Each country will have to assess its own achievements in this respect and review its programmes and institutional framework. Once these foundations are laid the subsequent promotion of small industry in high technology areas inherent to the electronics sector will contribute to achieve the objectives of modernizing and restructuring industry.

Eighth, the promotion of associations and self-help organizations would be an important measure. Support to the creation and operation of such industry sector associations and self-help organizations is therefore recommended. Such institutions may be independent and supported by industry and/or by Government. Besides industry-oriented objectives they might also take up functions of interest as representatives of small industry or specific sectors vis-à-vis policy making and other economic agents. Examples of their active contributions to strengthen the position of small industry can be taken from various industrialized countries and, among the Asian developing countries, from the Republic of Korea.

5. SUMMARY AND CONCLUSIONS

The present study undertaken in the framework of UNIDO's research programme in the field of small-scale industry development, is based on analyses of available documents and data and some limited field work in a few Asian developing countries. The investigations show that a great variety exists of small-scale industries. Small-scale industries of the engineering (and hence electronics industry) sector in developing countries range between the 'traditional' and the 'modern' enterprise. The traditional labour-intensive (on workers' level) enterprise is manufacturing relatively low priced products of low technological complexity and low quality standard. The modern, more physical and human capital-intensive and less labour-intensive technologically advanced and flexibly operating enterprise is manufacturing products of high quality standards.

In industrial countries small-scale engineering and electronics industries mainly operate on subcontracting or complementation schemes generally for several industrial customers. The purchasing companies, on the other side, have normally several supply sources for the same product. Both sides try to avoid monopoly situations and give great emphasis to diversification. In developing countries inter-industrial linkages of small-scale industry are less pronounced, and many small-scale enterprises are engaged in the production of consumer end products sold on the market. The production often consists of assembly operations, and the quality of these electronic consumer products is in average relatively poor.

Inter-industrial linkages in the electronics field can be divided into three categories:

- subcontracting of parts or spares - assemblies which will be incorporated into an end product by the purchasing company;
- complementation of production;
- maintenance and service functions.

The potential for industrial linkages is a direct consequence of cost awareness and consequential division of labour in an economy. The major conditions on the macroeconomic level are the existence of good

infrastructural facilities (transport and communications), promotion and support measures by public authorities, appropriate customs tax and industrial policies, access to technological innovation and human resources development schemes to bring out highly educated professionals. On the microeconomic level, the major conditions are specialization of production, support of formation of new companies and increased research and development efforts.

In the developing countries of Asia and the Pacific region there are approximately ten economies where domestic inter-industrial linkages between small-scale electronics and large scale engineering industries are of significant importance. These economies are China, Hong Kong, India, Indonesia, Republic of Korea, Malaysia, Pakistan, Philippines, Singapore and Thailand. An overview on the electronics industry in selected developing countries in the region shows that this sector is at an early stage of development in other countries such as Bangladesh and Sri Lanka. India has, among the countries considered, the most complete scope of production of electronic products due to its self-reliance policy; yet it has not been able to keep up the international pace of technological development. The country's small-scale electronics industry has a production share of approximately one third of total output in the sector and is mainly engaged in consumer electronics, control instrumentation and industrial electronics equipment and in computers and office equipment. In Pakistan, small-scale electronics industry is mainly engaged in the production of radios. It is estimated that in Indonesia more than 5000 small-scale enterprises are active in the manufacture and assembly of electrical and electronic products, a great number of them as subcontractors to large and medium sized companies. Malaysia and Thailand have, compared to their limited domestic production of electronic products (assembly operations are predominant there), a relatively strong offshore manufacturing electronics industry. The same holds for the Republic of Korea and Singapore; yet their domestic electronics industries, and also their small-scale electronics industries are by far more developed than those in Malaysian and Thailand. Republic of Korea and Singapore are the countries where great emphasis has since some time been given by policy makers to develop modern, high technology small-scale electronics industry and foster their linkages to large and medium, national or international, engineering products manufacturers.

Several countries have developed schemes for promotion of linkages of small-scale to large-scale industry which are also applied in the electronics field. Examples of these schemes are

- "the foster-father" system in Indonesia which relies on the guiding and supporting role of the large company which also gives technical assistance to the small-scale subcontractor; yet the system is somewhat negatively affected by various external factors;
- the system of ancillary industries in India which includes a purchasing guarantee of the large industry and which, however, seems to have a stiffling effect on product development and marketing efforts of the small-scale enterprise. It is also reported that product quality is generally poor and needs extensive control. Furthermore, technological innovation may not be sufficiently enhanced by the ancillarization scheme;
- the systematization of inter-industrial co-operation in the Republic of Korea which institutionalizes inter-industrial linkages and has led to a strong growth in four years (from 1979 to 1983) in the area of electronics subcontracting;
- product reservation schemes which reserve certain products for manufacturing by small-scale electronics industry have been introduced by India, Indonesia and the Republic of Korea;
- special attention to the electronics sector by institutions for the promotion of small-scale industry. In the Republic of Korea, where traditionally large-scale industry has been in the foreground of promotional activities, major attention is given since several years to the promotion of small industry. The major topic for these efforts is technological advancement. Hence, preference is given to the promotion of high technology small-scale enterprises. An institution of major importance for the promotion of small-scale electronics industry is the Korea Federation of Small Business which is characterized by an active participation of the small entrepreneurs. It is a co-operative federation where small enterprises are indirectly members through regional or sectoral associations or co-operatives of which five are related to the electrical and electronics field. This institution, among others, elaborates policy recommendations, conducts surveys on the status of small industry, promotes subcontracting linkages, gives business assistance, and promotes foreign trade of its members.

Significant inadequacies and constraints affect the small-scale electronics industry in some of the observed developing countries.

The various problems of the small-scale industry in the electronics field and the variances in promotional efforts illustrate the great differences among the developing countries in Asia and the Pacific region. In most countries additional policy measures to promote high technology small-scale

electronics industry will be required. The prime objective of these measures should not be to protect or to maybe over-protect the small electronics industry but to strengthen that sector's own resources and capacity to grow into new technological areas.

As far as product scope for small-scale industrial production is concerned, it can be assumed that the production of electronic components will, due to changing economies of scale, gradually shift from small- to large-scale producers. Continuous integration of production will also affect the existing parts production in many areas, e.g. in telecommunications the technological change from electro-mechanic to digital exchanges or in industrial process control system from electro-mechanic to electronic control devices. These technological changes negatively affect the 'traditional' subcontracting in the electronics field. On the other hand complementation seems to become more and more important both in the area of products, e.g. computer peripheral equipment, and in service functions, e.g. maintenance of equipment, application of computerized systems, process engineering and software generation.

Governments can play an important role in the promotion of inter-industrial linkages through their purchasing policy. The purchasing conditions can be modified in such a way that preference is given to offers with a high subcontracting content. Besides this measure, research and development contracts for products development and systems application should be used as a tool to promote inventiveness and creativity among the domestic small-scale electronics industry. These activities should be combined with increased efforts in human resources development through universities and special training and research institutes.

The small-scale electronics industry itself will require an extensive amount of technical and financial assistance, access to technological innovation, standardization and quality control and promotion of associations and self-help organizations. These measures should be supported by special policy measures such as fiscal incentives for subcontracting and complementation business, investment incentives and establishment of a legal framework for subcontracting and complementation.

COMPARISON OF SMALL INDUSTRY DEFINITIONS IN SELECTED ESCAP DEVELOPING ECONOMIES

| Categories | Employment | Investment | Others | |
|--|--|---|--|--|
| Bangladesh^{1/} | | | | |
| (a) Cottage industry | (a) mainly family and only few hired labour | (b) up to 30 lakhs investment in machinery and equipment | (a) up to 20 per cent of raw material can be imported origin | |
| (b) Small industry | | | (b) like (a), yet exceptionally up to 40 per cent | |
| India^{2/} | | | | |
| (a) Tiny units of small scale industry | (a) up to 2 lakhs | (b) up to 20 lakhs in machinery and equipment | (a) situated in towns and villages with less than 50,000 inhabitants | |
| (b) Small industry | | | (c) up to 25 lakhs in machinery and equipment | (c) engaged in (1) manufacture of parts, assemblies, (2) rendering of services, (3) depending by 50 per cent or more on other units using their products/services (4) not being subsidiary of other unit |
| (c) Ancillary enterprises | | | | |
| Nepal^{1/} | | | | |
| (a) Cottage industry | (a) up to 0.5 in rural and Rs. 0.8 million in urban areas | (b) fixed investment up to Rs. 2 million | | |
| (b) Small industry | | | | |
| Sri Lanka^{1/} | | | | |
| (a) Small and medium industry | | (a) less than Rs. 1 million in machinery and equipment | | |
| Indonesia^{2/} | | | | |
| (a) Cottage industry | (a) 1-4 employees | (c) up to Rp.70 million and investment per employee not exceeding Rp. 625,000 | (c) owned by Indonesian citizens | |
| (b) Small industry | (b) 5-19 employees | | | |
| (c) Small industry (as per degree of min. of industry-133/M/SK/B/1979) | | | | |
| Malaysia^{2/} | | | | |
| (a) Cottage industry | (a) less than 10 employees | (b) up to M\$ 250,000 | | |
| (b) Small-scale industry | (b) 10-49 employees | | | |
| Philippines | | | | |
| (a) Cottage industry | (a) less than 4 employees | (a) less than P 250,000 | (b) P 250,000 up to P 2.5 million | |
| (b) Small industry | (b) 5-99 employees | | | |
| Thailand | | | | |
| (a) Cottage industry | (no official definition) NESDB | | | |
| (b) Small industry | (a) less than 10 employees (b) 10-49 employees | | | |
| Hong Kong | | | | |
| (a) Small industry | no official definition customary (a) up to 49 employees | (a) up to US \$50,000 | | |
| Republic of Korea | | | | |
| (a) Small industry | (a) 5-300 employees | (a) up to 500 million won | | |

Source: 1/ N.T. Naq, The development of small and medium scale industries and the policies relating to them in the developing ESCAP countries (draft report).

2/ Assistance to the development of small industry in Indonesia, UNIDO/UNDP project No. DP/INS/76/078, report No. 3, July 1982.

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