Asian Semiconductor and Electronics Technology Service

Volume II
Government and Technology

Dataquest

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Introduction to the Service

The Asian Semiconductor and Electronics Technology Service (ASETS) documents, analyzes, and interprets all important aspects of the Asian semiconductor and electronics industries, as well as the Asian manufacturers that participate in the worldwide markets. The service comprises:

- Three loose-leaf data base binders containing sections that are continually revised and updated as developments occur or as additional information becomes available
- Timely newsletters reporting on significant industry developments—with additional binders provided for these newsletters
- Direct access to research staff in Seoul, Taipei, and San Jose for background information and for questions regarding the information contained in each volume

The service analyzes, interprets, and reports on the products, markets, and strategies of the major Asian companies in the semiconductor and electronics industries, with a specific focus on the Asian market. The service also presents valuable information on the government, economy, and industrial policy of each Asian country and will provide periodic pertinent updates to these subjects. ASETS provides data with which to make strategic decisions. We perform the following functions:

- Monitoring Asian R&D projects and corporate spending in the following areas:
  - Semiconductors
  - Computers
  - Telecommunications
- Analyzing semiconductor technology trends on a quarterly basis
- Evaluating plant capacity expansion and design center activity
- Analyzing trends in strategic alliances
- Tracking Asian semiconductor production, inventory, shipments, exports, imports, and consumption for the major products
- Forecasting 10-year consumption figures for all semiconductor categories
- Examining and analyzing the consumer and industrial electronics end-user markets

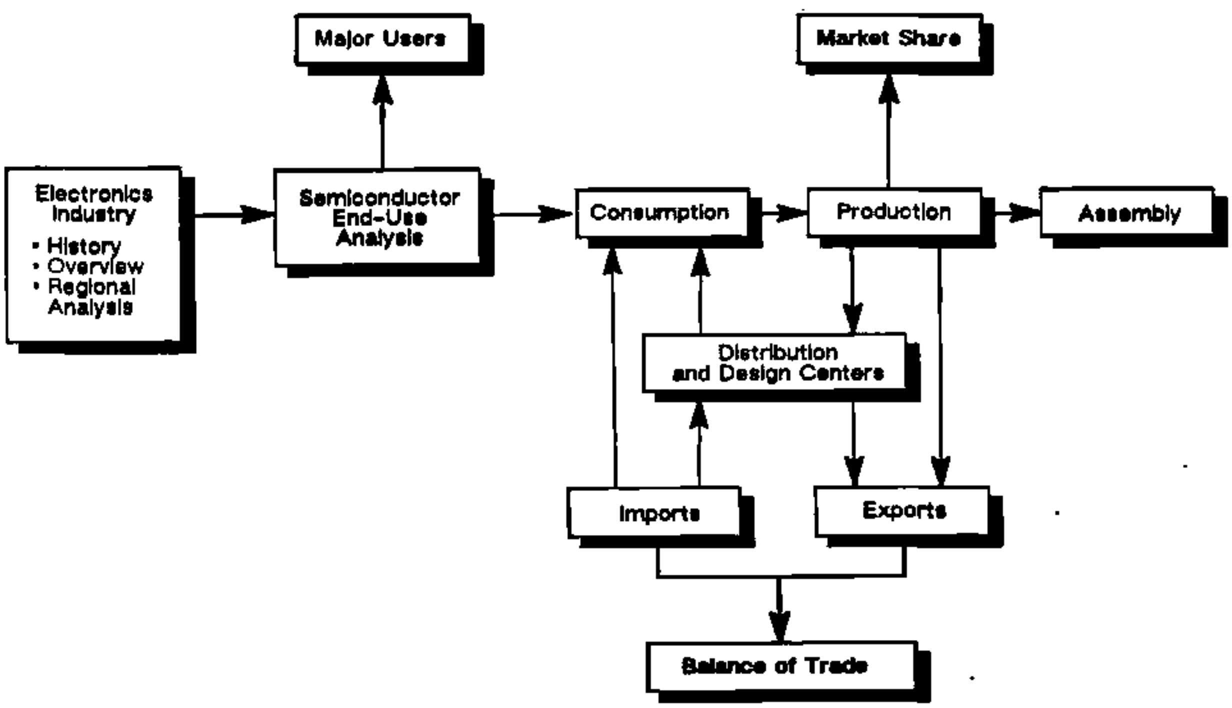
Introduction to the Service

- Profiling the major Asian semiconductor companies, emphasizing their products and strategies
- Analyzing the forces affecting the Asian semiconductor markets

Dataquest monitors the Asian semiconductor and electronics industry using the system shown in Figures 1 and 2.

Figure 1

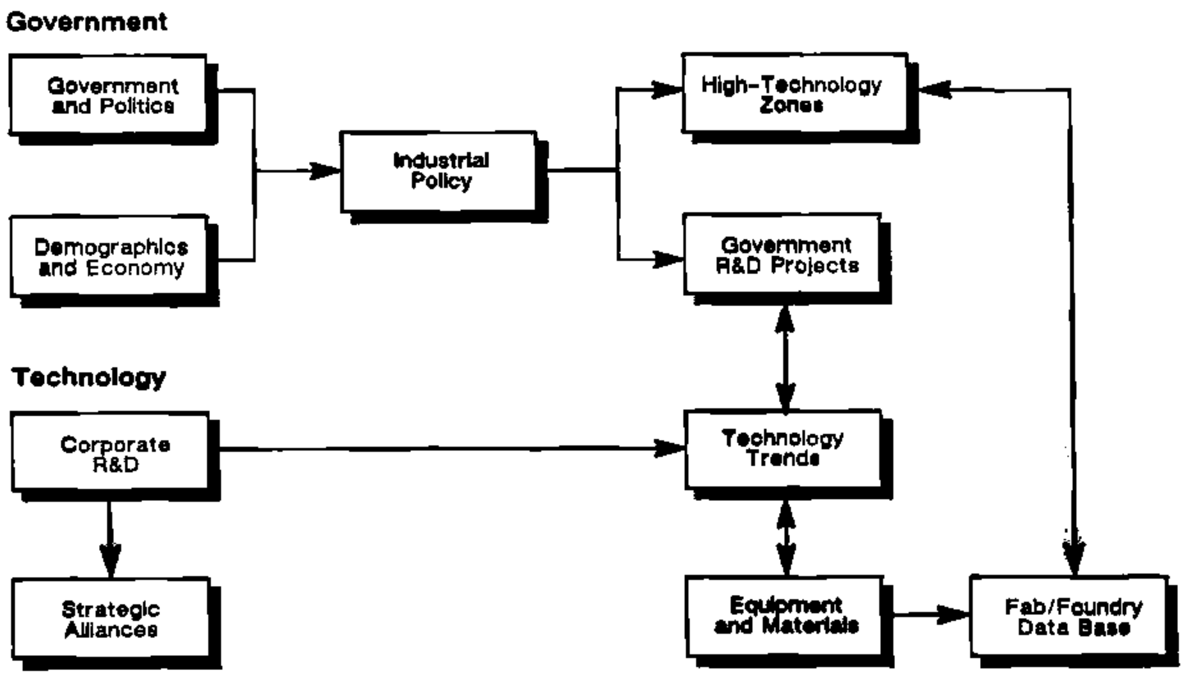
Products and Markets (Volume I)



Source: Dataquest April 1988

Figure 2

Government and Technology
(Volume II)



Source: Dataquest
April 1988

NEED FOR THE SERVICE

Since 1975, Dataquest's Semiconductor Industry Service has offered comprehensive worldwide market research to semiconductor manufacturers, semiconductor users, and suppliers of semiconductor manufacturing equipment and materials. As individual geographic markets expanded, it became obvious that each of these areas was developing its own unique characteristics. This is especially true of Asia, since it is becoming an important industrial power.

Introduction to the Service

Much has been written about Asia, but there is no other single detailed, comprehensive, continually updated and unbiased analytical service in the semiconductor market. With the movement of both finished and unfinished semiconductor products across geographic borders, available industry statistics sources have become less useful. Hence, there is a growing need for the type of information that Dataquest provides through its continuous industry coverage, updated data base, and analyses of observed trends.

SERVICE ORGANIZATION

Volume I—Products and Markets

Volume I contains specifics of the semiconductor and electronics industries in Asia. It is divided into the following sections:

- History of the Industry—Discusses the background of the industry in Asia and gives an overview of the current industry situation
- Electronics Industry—Provides an overview of the increasing part that the electronics industry plays in Asia; includes in-depth discussion of the Asian consumer and PC industries
- Semiconductor End Use—Analyzes the major semiconductor products that are used in the consumer and industrial markets and the major subsections of those markets
- Major Semiconductor Users—Provides names of major users and their semiconductor consumption level
- Consumption/Production—Contains Asian semiconductor shipments, production, and consumption history and forecasts
- Market Share—Contains worldwide shares for the major Asian manufacturers and market shares in Asia for the major Asian, U.S., European, and Rest of World manufacturers
- Imports/Exports—Contains Asian import and export statistics for the major semiconductor families
- Distribution—Describes the role played by agents and distributors in Asian semiconductor sales through distribution; lists the major distributors
- Electronic Products—Analyzes the major Asian electronics product markets with respect to consumption, production, imports and exports, and technology trends.

- Design Centers—Contains information about high-technology design centers in selected markets
- Assembly Industry—Provides an overview of the Asian contract assembly industry; lists the major assembly companies

Volume II—Government and Technology

Volume II of ASETS contains separate sections for each of the following:

- Demography and Economy—Provides population, work force, and educational system profiles; analyzes economic data
- Government and Politics—Describes governmental structures, taxation, and pertinent political activities
- Industrial Policy—Describes strategies for industrial development and the basic framework for Asian industries
- Government R&D Projects—Reviews the major national R&D projects covering semiconductors, computers, and telecommunications
- High-Technology Zones—Reviews the Asian countries' high-technology zones
- Corporate R&D—Evaluates trends in corporate R&D spending and the opening of new basic research laboratories
- Strategic Alliances—Analyzes joint venture, licensing, and second-sourcing agreements entered into by Asian semiconductor device and system makers
- Technology Trends—Discusses major trends in Asian semiconductor technology
- Fab/Foundry Data Base—Lists and describes Asian fabrication and foundry operations
- Equipment and Materials—Describes equipment and materials used by Asian semiconductor manufacturers; provides information on supply sources

Volume III—Company Profiles

The third volume comprises profiles of major Asian merchant semiconductor companies, including analyses of sales channels, financial structures, and product portfolios. It also examines factory locations, their technologies, and their organizational structures. Semiconductor revenue for most companies is split by geographic region. The companies covered include:

- Daewoo
- Elcap
- ERSO
- ETRI
- Fine
- Goldstar
- Hua Ko
- Hyundai
- KEC
- Mitac
- Multitech
- RCL
- Rectron
- Samsung
- Tatung
- Teco
- UMC

SERVICE FEATURES AND PROCEDURES

The date of preparation is noted on the bottom of each page of a document. Sections are updated regularly, and filing instructions are sent with the new versions. The table of contents is also updated regularly to enable you to verify that your binders are current and complete.

Newsletters are published monthly and should be filed in the Newsletters binder. The newsletters are devoted to current topics of specific Asian interest and to international industry developments.

The inquiry privilege permits the binderholder to contact Dataquest by mail, fax, telegram, telephone, telex, or in person to request copies of printed material, data, or opinions on topics covered by the Asian Semiconductor and Electronics Technology Service. The principal information collections are maintained at our San Jose, California, headquarters and, with the exception of confidential or proprietary material, are available to all our subscribers. We also have research staffs in Seoul and Taipei that maintain pertinent information on the material contained in the ASETS data base.

Introduction to the Service

DATAQUEST LOCATIONS

The Asian Semiconductor and Electronics Technology Service (ASETS) has its headquarters in our San Jose, California, office. Clients can address their inquiries to this office or to their local office.

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ASETS STAFF

The ASETS staff has a continuing, long-term commitment to the semiconductor and related electronics industries. The expertise and experience of the worldwide Semiconductor Industry Service staff and access to the resources of other Dataquest high-technology industry groups further enhances the quality of our service.

Introduction to the Service

Members of Dataquest's professional staff are frequent speakers at industry seminars and symposia. We participate in the leading professional societies related to the electronics industry. We maintain contact with a large user base through sophisticated sampling and interviewing techniques. Our staff regularly reviews all important publications related to the semiconductor industry and associated user industries.

SUBSCRIPTION TERMS

Basic Terms

The service begins on the date of the first billing. At that time, the binderholder receives four service binders containing complete, up-to-date material and copies of all recent newsletters. For the duration of the subscription, the binderholder receives a copy of each additional or replacement section of the notebook and each newsletter published. Direct access to the service staff may be used for questions related to the Asian Semiconductor and Electronics Technology Service.

Add-On Subscriptions

Subsidiaries, divisions, regional offices, majority-owned affiliates, and parent companies of the subscribing organization are eligible for add-on subscriptions at a fraction of the base price for each additional subscription.

Relationship to Dataquest's Semiconductor Industry Service

ASETS is intended to complement the existing Semiconductor Industry Service (SIS). Topics of general interest (such as discussions of technological advances) will be covered only to the extent that they specifically affect Asia. These companion services are offered separately as components of Dataquest's international semiconductor industry program.

Base Price and Payment Terms

Industrial clients will be billed annually for the full price of the service. Dataquest reserves the right to raise its subscription prices to reflect broadened scope or increased costs. Subscribers will be notified in advance of any such price increase.

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Demography and Economy--India

OVERVIEW OF THE INDIAN ECONOMY

The outlook for the Indian economy, which has entered the fourth year of the 1985 to 1990 five-year plan, is optimistic. For the first time in a drought year, the economy grew, albeit slightly, at 1.7 percent. Industrial growth in 1987 will not only be positive, but will exceed the economy's performance during normal years a decade ago. Under the severe drought circumstances, the Indian economy has shown a surprising degree of resilience.

In 1979 to 1980, the last period in which there was a drought of comparable magnitude, food production dropped 17 percent. Last year, the fall in production was a more manageable 10 percent. Then, prices rose a frightening 17 percent, followed by an 18 percent price increase the following year. Last year, inflation is estimated to have remained well below this pace, at about 10 percent. Then, industrial growth was a negative 1.4 percent, whereas last year's industrial growth was a positive 7.0 percent. Finally, in the previous period, GNP growth was a negative 4.9 percent; 1987 GNP growth is estimated to have been a positive 1.7 percent.

Nonetheless, the consecutive poor monsoon seasons have contributed to poor agricultural performance. Production of food grain in fiscal 1986-87 was approximately 152 million tons, 1.5 percent growth over the previous year. Because the poor monsoon is threatening to detrimentally affect agricultural output again this year, the production of rice, coarse grains, pulses, and cash crops (such as groundnuts and jute) may be below last year's level. However, with the overall supply position of food grain at 22 million tons, there is a comfortable buffer against peak operational stock requirements of about 15 million to 16 million tons.

Prices are estimated to have risen 10 percent in 1987, surprising in light of last year's poor monsoon season. The public food distribution system helped see that essential commodities reached the population, helping to contain inflation. Also, the comfortable margin in foodstocks should help constrain any substantial near-term surge in prices.

India's industrial sector has shown satisfactory performance, growing 9 percent in 1985 and 7 percent in 1986, and between 6 and 7 percent in 1987. The tertiary sector, which currently accounts for about 45 percent of the gross domestic product (GDP), also shared in high growth. During the 1980s, power generation, coal mining, and railway transportation have registered a compounded annual growth rate (CAGR) of 8.8 percent, 6.2 percent, and 5.7 percent, respectively. Crude oil production has had an average CAGR of 31.2 percent since 1980. Table 1 shows that some infrastructural industries have grown faster than the trend, indicating accelerating growth.

Fiscal, industrial, and trade liberalization policies, initiated during the past few years to improve economic efficiency and competitiveness and to promote growth, are beginning to show favorable effects. The initial adjustment problems associated with switching from a sheltered, relatively closed economy to a more open, free-market-oriented one have significantly eased. Numerous industries, including steel, cement, sugar, and electronics, are showing increased productivity.

Table 1

Industrial Infrastructure Performance—India

Industry	1985-1986	1986-1987	Δ%
Coal (Millions of Tons)	154.24	166.00	7.6%
Electricity Generated (Millions of kWh)	170,302	190,000	11.6%
Petroleum Crude (Thousands of Tons)	30,200	30,250	0.2%
Freight Earnings (Millions of Tons)	258.5	302.0	16.8%
Parts (Cargo Handled) (Million of Tons)	120.0	121.7	1.4%

Source: Economic Wing, Indian Embassy

India's investment climate has improved as a result of favorable policy combined with improvement in the infrastructure. More than 1,200 letters of intent for new ventures were issued last year. The effect of delicensing selected industries was reflected in the large number of business schemes registered, which rose to 1,167 in 1985 and 2,387 during 1986. The goals of modernizing industry have been seriously pursued; nearly 1,000 foreign business collaborations were approved in 1986.

The high cost structure of Indian industry has become an area of recent concern. The primary reason for high overhead costs has been that industries have been faced with little domestic or international competition. Noting these weaknesses and also significant improvement in the availability of capital, skilled labor, and entrepreneurship, the entire system of control and regulation has been reviewed in recent years, and the current government has vigorously pursued the objective of streamlining the regulatory process. For the most part, it has created an improved climate, enhancing efficiency and improving industrial growth.

The recovery in exports is central to India's overall growth strategy. Measured in rupees, India's exports registered an increase of 20.4 percent—in dollars, 15.3 percent—in the 1986 to 1987 period as compared with 1985 to 1986. Earnings from exports, such as ready-made garments, leather, gems and jewelry, chemicals and allied products, machinery, transportation equipment, and metal manufacturers, registered significant growth. In the first three months of fiscal 1987 (April through June), these exports grew by 32.4 percent over the corresponding period in 1986. A policy package has recently been offered to boost exports of 35 product lines in the engineering sector. Similarly, a plan of action in selected sectors, including agriculture, processed foods, and marine equipment, has been finalized.

In spite of measures taken toward efficient import substitution, particularly of bulk imports, India's import bill is likely to grow in the coming years with growing demand for various capital equipment required for further modernization.

Table 2 highlights important statistics of recent Indian economic performance.

Table 2

Economic Statistics--India

Indicator	1984-1985	1985-1986	1986-1987
Population (Millions)	739	754	766
Growth Rate	2.1	2.0	1.6
Real GDP Growth (Percent)	3.7	5.1	5.0
Gross Domestic Capital Formation (Percent of GDP)	24.4%	24.6%	25.0%
Gross Domestic Savings (Percent of GDP)	22.9%	22.8%	23.0%
Food Grain Production (Millions of Metric Tons)	146.2	150.5	151.0
Growth Rate	(4.5)	2.9	0.3
Industrial Production (Percent)	6.8%	6.3%	7.5%
Wholesale Price Index (Percent)	7.1%	5.8%	5.3%
Foreign Exchange Reserves (Billions of Dollars)	$ 5.5	$ 5.9	$ 5.9

(Continued)

Table 2 (Continued)

Economic Statistics--India

	1984-1985	1985-1986	1986-1987
Total Exports (Billions of Dollars)	$ 9.5	$ 8.8	$ 10.6
Growth Rate	21.3	(7.4)	20.5
Total Imports (Billions of Dollars)	$ 13.7	$ 15.8	$ 16.6
Growth Rate	8.9	15.3	5.1
Trade Deficit (Billions of Dollars)	$ 4.3	$ 7.0	$ 6.0
Trade Balance (Percent of GDP)	2.8%	4.0%	3.0%
Debt Servicing (Including Interest Payments) (Millions of Dollars)	$979.6	$1,138.7	$1,332.8
Growth Rate	.	16.24	17.0
Net Inflow of External Assistance (Millions of Dollars)	$981.3	$1,308.6	$1,866.8

Source: Economic Wing, Indian Embassy

AGRICULTURE

For a nation once referred to as the "begging bowl" of Asia to be currently self-sufficient in food grain is quite an achievement. India's food grain production was approximately 50 million tonnes (metric tons) in 1950. In the last four decades, food grain production has tripled, and government grain elevators are essentially full, ready to meet almost any contingency or natural calamity. A special report of the Rockefeller Foundation recently recognized these achievements by observing, "The speed with which India's farmers and scientists suddenly gave their country an approach to an almost abundant food supply has never been duplicated on an equal scale anywhere in the world, including the . . . United States."

The government mounted a vigorous effort toward agricultural self-sufficiency because of the slow growth in food grain production as opposed to the much faster population growth and the frequent natural calamities. Agricultural development took precedence over all other economic development.

A national (agricultural) extension service was begun in 1951 to bring technology from the laboratory and university to the farmer in the field. But it was expansion of cultivated land, not technology, that was the major source of agricultural growth from 1950 to 1965.

The "green revolution" (agricultural development based on scientific advances in farm technology) came to India in 1966 and 1967. Food grain production, which totaled 50.8 million tonnes in 1950 and 1951, grew to 82.0 million tonnes in 1960 and 1961, to 108.4 million tonnes in 1970 and 1971, and reached a record level of 150.0 million tonnes in 1985 and 1986. Initially, rapid increases in production were due to contributions of high-yielding varieties of Mexican wheat and dwarf rice. However, subsequent productivity increases were primarily the result of efforts by indigenous scientists, planners, administrators, the extension service, and, of course, the farmers. The revolution continues to spread from the progressive states to the agriculturally less-developed states and regions.

Growth in food production owes a great deal to development in India's agricultural infrastructure, particularly in the areas of research and education, irrigation, fertilizer production, and storage and distribution of food grain.

A plentiful supply of bank credit and an agricultural commodities price regime, ensuring adequate market support for farmers, also contributed significantly to India's agricultural growth and development.

The agricultural policy during the 1985 to 1990 five-year plan emphasizes minimizing both crop and regional production imbalances. The major policy objectives include development of dry land farming, increased production of oil seeds and pulses, and the promotion of rice development in India's eastern quarter. India has launched nationally funded projects to develop rain-fed agriculture and to boost production of oilseeds.

India's commitment to a national food security system will be vital to its drive for economic independence. Finally, some concern exists among agricultural officials that India's agricultural production has reached a plateau. India's food grain production target of 230 million tonnes by the year 2000, while achievable, will certainly remain a significant challenge for the remainder of this century.

Statistics of agricultural production by major crop types, growth in irrigation, and India's agricultural production with respect to worldwide production are presented in Tables 3, 4, and 5, respectively.

Table 3

Agricultural Production—Major Crops—India
(Millions of Metric Tons)

Crop	1950-1951	1985-1986	Growth Rate between 1950-1951 and 1985-1986 (Percent per Year)
Food Grain	50.8	150.5	3.2%
Cotton	3.0	8.6	3.1%
Jute and Mesta	3.3	12.7	3.9%
Oilseed	6.2	11.2	1.7%
Sugarcane	57.0	171.7	3.2%

Source: Economic Wing,
Indian Embassy

Table 4

Growth of Irrigation—India
(Millions of Hectares)

Irrigation	1950-1951	1985-1986	Percent Increase
Major and Medium			
Potential Created	9.7	30.6	215%
Utilization	9.7	25.8	166%
Minor			
Potential Created	12.9	39.2	204%
Utilization	12.9	36.4	182%
Total			
Potential Created	22.6	69.8	209%
Utilization	22.6	62.2	175%

Source: Economic Wing,
Indian Embassy

Table 5

India in World Agriculture

	Production (Millions of Metric Tons)		Percent Share of World Production	
Crop	1955	1985	1955	1985
Rice	46.3	90.5	20.4%	19.5%
Wheat	8.0	44.2	3.1%	8.6%
Sugarcane	71.6	174.0	13.3%	14.2%
Tea	325.0	670.0	35.7%	28.7%

Source: Economic Wing,
Indian Embassy

Demography and Economy—India

DEMOGRAPHY

In India, the benchmark poverty line is approximately US$9 per capita in rural areas and US$10 per capita in urban areas. On this basis, approximately 275 million people, or about 35 percent of India's population, have been classified as poor. The government's antipoverty programs, implemented during fiscal 1977-78 through fiscal 1983-84 period, have enabled 36 million individuals to leave the ranks of the officially classified poor.

The Integrated Rural Development, National Rural Employment, and Rural Landless Employment Guarantee Programs have been implemented to assist the poor among India's small farmers and landless laborers. In addition, special programs address the particular needs of drought-prone areas and those with generally adverse agricultural climates.

Direct financial outlays for antipoverty programs have grown significantly during the past three years. The fiscal 1986-87 budget increased appropriations by 64.7 percent, from about US$730.0 million in fiscal 1985-86 to about US$1.2 billion.

The Indian government has made significant gains in reducing the plight of low-income groups. But the challenge to alleviate India's poor will persist for several years to come. Government officials estimate that about 210 million people will still fall below the poverty line in fiscal 1989-90.

Table 6 highlights important demographic statistics and indicators of India's quality of life.

Table 6

Demographics—India

Characteristic	1984-1985	1989-1990
Life Expectancy		
Male	56.1	58.6
Female	57.0	59.7
Infant Mortality Rate (per Thousand Births)	106	90
Birth Rate (per Thousand)	32.6	29.1
Urbanization (Percent)	24.70%	26.85%

(Continued)

Table 6 (Continued)

Demographics—India

Characteristic	1984-1985	1989-1990
Per Capita Consumption of Food Grain (kg)	178	193
Per Capita Consumption Expenditures (in US$ at 1984-1985 Prices)	164.9	189.2
Per Capita Generation of Electricity (kWh)	226	362
Percentage of People below Poverty Line	37	26
Employment (Millions of Person-Years*)	187	227
	1971	1981
Literacy Rate (Percentage)	29.5%	36.2%
Male	39.5%	46.9%
Female	18.7%	24.8%

*Person-Year = 8 hours of work per day for 273 days per year

Source: Economic Wing, Indian Embassy

INDUSTRY

A striking feature in India's economic development during the past four decades has been its progress toward industrialization. India has achieved the capability to manufacture machinery for its major industries, which include aircraft, shipbuilding, automobile, heavy vehicle, locomotive, heavy electrical, construction, power generation and transmission, precision instruments, and machine tools. Consumer goods, such as refrigerators, television sets, and household appliances, are all indigenously manufactured. India's corporate and governmental leadership is currently pursuing new frontiers of industrial technology, including electronics, computer sciences, telecommunications, space, and oceanic development. In the words of Prime Minister Rajiv Gandhi, India's path to high technology is relatively eclectic: "We would have liked it to be much better; it is improving but a lot more needs to be done. We have in our development process laid a very broad base for industrial development, unlike some other developing countries who have concentrated on a few specific items and done very well."

Industrial growth was 9 percent in 1985 and 1986, and 7 percent in 1986 and 1987. Growth in this range is likely to be maintained during the current year due to improved performance in sectors such as steel, cement, and sugar. Capital equipment and raw materials now account for about 48 percent of India's total industrial production; intermediate goods, for about 21 percent; and consumer goods, for about 31 percent.

India's key industries—steel, engineering, machine tools, and electronics—have made significant strides. India manufactures approximately 14.5 million tons of steel from six major plants. There are also about 200 very small steel mills with a total production capacity of more than 6.2 million tons per year. India manufactures a wide range of engineering products, from hand tools to heavy-duty hydraulic equipment. Capital equipment used for mining, transportation, agriculture, and irrigation is also manufactured locally. Textiles are an important industrial sector, with more than 55 manufacturers. Approximately 30 percent of the world's diesel engines of both low and high power output are manufactured in India. India also exports design and fabrication expertise for steel, commercial structures, power transmission towers, commercial vehicles, and other transportation equipment. Approximately 150 major business firms are engaged in the manufacture of machine tools that are exported to North America and Europe.

Policy initiatives undertaken during the previous two years have led to increased optimism for higher future industrial growth. Industrial deregulation, including delicensing of selected industries, is likely to continue. Just recently, a number of streamlining refinements were made to the existing regulatory process, while licensing procedures were simplified. As a result of these moves, 27 broad categories of industries and 82 bulk drugs and related formulations were delicensed. A total of 97 industries has been removed from coverage of certain provisions of the Monopolies Restrictive Trade Practices Act.

Tables 7 and 8 highlight statistics related to production in selected industries and the investment climate.

Table 7

Production Performance of Selected Industries—India

Industry	1986-1987	April-July 1987-1988
Coal Production (Millions of Tonnes)	165.8	51.6
Percent Change from Previous Year	7.6%	11.5%
Electricity Generated (Millions of kWh)	187,568	65,195

(Continued)

Table 7 (Continued)

Production Performance of Selected Industries—India

Industry	1986-1987	April-July 1987-1988
Percent Change from Previous Year	10.3%	9.8%
Hydroelectric (Millions of kWh)	53,744	16,614
Percent Change from Previous Year	5.5%	(0.5%)
Thermal (Including Nuclear) (Millions of kWh)	133,824	48,581
Percent Change from Previous Year	12.4%	13.8%
Saleable Steel (Thousands of Tonnes)	8,219.3	2,440.7
Percent Change from Previous Year	5.7%	16.8%
Cement (Thousands of Tonnes)	36,400	12,020
Percent Change from Previous Year	9.9%	6.3%
Crude Petroleum (Thousands of Tonnes)	30,463	10,148
Percent Change from Previous Year	1.0%	(1.3%)
Petroleum Products (Thousands of Tonnes)	45,688	15,222
Percent Change from Previous Year	6.5%	9.2%

Source: Economic Wing, Indian Embassy

Table 8

Investment Climate—India

Occurrences	1985-1986	1986-1987
Letter of Intent Issued (January-December)	1,458	1,131
Industrial Licenses Granted (January-December)	985	618
Industrial Approvals	2,624	3,517
Schemes Registered under Delicensing Scheme (January-December)	1,167	2,387
Foreign Collaboration Approved (January-December)	1,024	958
Foreign Investment Approvals (US$ Billions)	$0.10	$0.09
Capital Consents (US$ Billions)	$2.96	$4.70

Source: Economic Wing, Indian Embassy

CAPITAL MARKETS

India's capital markets have shown considerable momentum during the 1980s, and the amount of capital raised has shown equally outstanding growth. Consents for capital issues increased sharply from about US$188.4 million in 1980 to about US$2.96 billion in 1985. Total consents for capital issues were valued at approximately US$4.7 billion in 1986. There has also been equally outstanding growth in the value of public issues of capital through debt and equity from about US$100.0 million in 1980 to about US$1.7 billion in 1985. The total value of new debt and equity issues closed at about US$3.0 billion in 1986.

Currently, 14 stock exchanges are registered in India. Listed companies increased from 1,135 in 1946 to about 4,500 in 1986. The number of scripts of shares and debentures has grown at a much faster pace, from 1,506 in 1946 to approximately 7,000 in 1986. India's capital markets accounted for less than 1.0 percent of household savings in 1975. The savings rate increased to 2.5 percent in 1982 and almost doubled to 5.0 percent in 1985. It is estimated that India's capital markets mobilized more than 6.0 percent of household savings for corporate investment in 1986.

Important statistics relating to Indian capital markets and investments are shown in Tables 9 and 10, respectively.

Table 9

Capital Market Indicators—India

Indicator	1946	1984	1985
Number of Vested Companies	1,125	3,882	4,344
Number of Vested Scripts	1,506	5,684	6,714
Paid-Up Share Capital of Vested Companies (Rs Million)	Rs2,700	Rs50,820	Rs60,760
Market Value of Vested Paid-Up Share Capital (Rs Million)	RS9,710	Rs99,840	Rs210,770

Source: Economic Wing, Indian Embassy

Table 10

Investment Pattern—India
(Billions of U.S. Dollars)

Period	Outlay	Public	Private
1969-1974	$ 22.50	$ 14.34	$ 8.16
1974-1979	$ 60.43	$ 35.84	$ 24.58
1980-1985	$156.55	$ 88.63	$ 67.91
1985-1990	$316.49	$163.60	$152.86

Source: Economic Wing, Indian Embassy

FOREIGN COLLABORATION

India invites and encourages foreign business collaboration, which is seen as the most effective means of technology transfer. Forty percent of approved manufacturing activities are foreign-owned. High-technology ventures, however, are permitted to have foreign equity ownership of as much as 74 percent. A total of 958 foreign collaborations were approved by the Indian government in 1986. The United States and West Germany are the two leading foreign collaboration partners, with 183 collaborations each.

Tables 11 and 12 highlight important statistics of recent foreign collaboration activity.

Table 11

Foreign Collaboration Approvals during the Last Five Years—India

Year	Financial	Total
1981	57	389
1982	113	590
1983	129	673
1984	151	752
1985	238	1,024
1986	242	958

Source: Economic Wing, Indian Embassy

Table 12

Foreign Collaboration Approvals by Country—India

Country	Number of Collaborations Approved During 1957-1986	Number of Collaborations Approved in 1986	Investment Approvals in 1986 (Rs Million)
United States	2,078	183	Rs 293.69
West Germany	1,909	183	201.57
United Kingdom	2,162	130	77.15
Japan	970	111	56.16
France	525	39	20.48
Italy	440	58	23.30
Switzerland	582	32	32.53
Others	1,952	222	419.10
Total	10,618	958	Rs1,123.98

Source: Economic Wing, Indian Embassy

FOREIGN TRADE

An average export volume growth of 7 percent per year during the 1985 to 1990 five-year plan will be imperative to sustain India's economic development. In the first year of the plan, exports other than oil are estimated to have grown in volume by only 2 percent due to the fierce international competition for many Indian products.

India's foreign trade situation in fiscal 1986-87 showed marked improvement over the previous year, with the trade deficit declining 18.4 percent. Exports totaled about US$10.5 billion against imports of about US$16.9 billion, resulting in a trade deficit of about US$6.4 billion.

Recent declines in world oil prices have translated into slower growth of India's exports, of which oil is a significant item. The decline in imports has been caused by import substitution of fertilizers, chemicals, and edible oils. Capital goods and equipment are areas in which imports have increased.

Important statistics relating to India's foreign trade are summarized in Tables 13 and 14.

Table 13

Foreign Trade—India
(Millions of U.S. Dollars)

Year	Exports	Imports	Trade Deficit
1984-1985	$ 8,746	$14,400	$5,654
1985-1986	$ 9,350	$17,184	$7,834
1986-1987 (Estimated)	$10,470	$16,860	$6,390

Source: Economic Wing,
Indian Embassy

Table 14

Estimated Exports and Imports by Region—India
1986–1987
(Billions of U.S. Dollars)

	Exports	Imports
Eastern Europe	$22.0	$ 11.0
North America	20.0	16.0
Africa	3.3	3.5
Asia and Oceania	32.0	40.0
Western Europe	22.0	30.0
Total	$99.3	$100.5

Source: Eonomic Wing,
India Embassy

Demography and Economy--South Korea

DEMOGRAPHY

Information pertaining to South Korea's climate, population, and educational system is given in Tables 1 through 4. Table 1 presents Seoul's climatic conditions; Tables 2 and 3 contain current population, birth rate increase, and population density figures; and Table 4 provides statistics about education in South Korea.

Table 1

Climate Data—Seoul Area

Month	Temperature (Degrees C)	Humidity	Precipitation (mm)
January	(3.7)	64%	28.0
February	(3.2)	64%	5.0
March	5.2	63%	32.8
April	10.1	65%	216.7
May	16.5	65%	90.3
June	21.6	76%	118.8
July	22.7	80%	259.2
August	22.8	76%	331.5
September	19.6	66%	58.3
October	13.0	62%	44.9
November	8.6	65%	10.6
December	(3.8)	64%	46.3

Source: Central Meteorological Office of Korea

Table 2

Population Statistics—South Korea
(Thousands)

	1983	1984	1985	1986	1987
Men	20,162	20,479	20,702	20,961	22,219
Women	19,789	20,099	20,354	20,608	20,863
Total	39,951	40,578	41,056	41,569	42,082
Birth Rate Increase	1.46%	1.34%	1.25%	1.24%	1.21%

Source: South Korean Census Bureau

Table 3

Population Density—South Korea, Taiwan, and Japan
(1985)

Country	Area (Thousands of Square Miles)	Population (Millions)	People/ Square Mile
Japan	146	120.8	827
South Korea	39	40.5	1,038
Taiwan	14	19.6	1,400

Source: Asian Economic Journal
Dataquest
October 1988

Table 4

Educational System—South Korea
(1986)

School	Number of Schools	Students Enrolled	Students Graduated
Vocational High School	631	916,893	280,814
Junior Vocational College	120	250,652	75,572
College, University	100	971,127	132,848

Source: Korean Economic Yearbook

ECONOMY

Economic Overview

In the early 1960s, the South Korean government introduced a system of five-year economic plans to provide a framework for economic development. These plans were drawn up by the government in consultation with other relevant bodies. In the years following the introduction of the first plan in 1962, South Korea achieved remarkable growth, with the gross national product increasing 450 percent in real terms to $57.4 billion in 1980. (Unless otherwise specified, in-text currency references are to U.S. dollars.)

During this period, South Korea's development was led by a variety of government incentives and an emphasis on exports, which reached $47.3 billion in 1987, compared to only $55 million in 1962. Expansion was also supported by successfully raising the share of domestic savings as a percent of GNP from 2.9 to 32.8 percent.

The rapid development during the 1960s and 1970s resulted in great changes in South Korea's the economic environment. There was a marked shift in employment from agriculture to the manufacturing industry, and labor-intensive production gradually gave way to more technology and capital-intensive manufacturing processes. Inevitably, the speed of these changes led to a number of structural imbalances that became more and more problematic as the seventies drew to a close.

The five-year plan (for the period from 1982 through 1987) was formulated to settle such problems as high inflation, the uneven distribution of financial assets, and many environmental problems. Although high growth of about 7 to 8 percent a year was still envisaged, the emphasis shifted from the previous plans toward measures designed to promote stability, enhance efficiency, and balance future development. Great attention was also given to the question of social welfare and equity, in recognition of the public's growing concern over these matters.

The plan's highest priority was to achieve economic stability, which was considered essential to strengthen industrial competitiveness and improve the balance of payments. The government expected the trade deficit to decline from $4.4 billion in 1980 to $2.4 billion in 1982, due to more rapid growth in exports than imports.

However, the international economic recession of 1980 through 1982 led to a vastly different outcome during the first two years of the plan's implementation. On one hand, although the average GNP growth was fairly close to projections, the world recession was deeper and longer than expected, and export growth did not begin to reach the planned levels until the middle of 1983. On the other hand, the decline in crude oil prices and some other raw materials, together with very successful harvests and appropriate monetary and fiscal policies, allowed the fight against inflation to succeed far beyond expectations. Lower costs also reduced the value of imports, despite the gradual liberalization of import restrictions, and the 1983 trade deficit was only about a third of that experienced in 1981. The balance of trade improved more over the two-year period than was originally planned for the entire five-year period.

In 1984, the plan was revised to reflect the impact of the worldwide recession of 1980 through 1982. As well as updating the macroeconomic forecasts, the revised five-year plan stressed the importance of linking future economic growth benefits with the enhancement of the quality of life. The policies to be emphasized in the last year of the plan period include reducing pollution, further improving the transportation system, encouraging more balanced regional development, and expanding public health facilities.

As originally drafted, the 1982 through 1987 five-year plan concentrated on solving the structural problems that had developed over the previous two decades of rapid growth and on absorbing the effects of the second oil shock. The revised plan sought to deal with only those structural problems remaining after the successful adjustment to a low-inflation environment in 1982 and 1983, and was set against a different international environment.

Economic Analysis

The year 1983 was one of regaining the growth momentum following the recession of the 1970s. South Korea's 1983 real GNP grew 9.5 percent over 1982. Consumer prices rose only 2.4 percent, wholesale price inflation was essentially flat, and the current account deficit declined 40 percent (see Table 5). In addition, the growth of external debt slowed substantially. For example, during every year from 1978 to 1982, about

$5.6 billion was added to South Korea's foreign debt. But in 1983, the increase was only $3.3 billion. South Korea's exports increased by $2.6 billion, reaching $24.4 billion in 1983, an 11.9 percent increase over 1982.

The year 1984 was another good period for the South Korean economy. GNP growth was robust at 7.7 percent, prices were stable, and the international balance of payments improved. In addition, government policies continued to make structural improvements to enhance efficiency and promote fairer competition in many areas of the economy.

GNP reached $95.3 billion in 1986, as opposed to the $90 billion forecast, while per capita GNP reached $2,300. The higher GNP reduced unemployment to 3.4 percent from the 4 percent expected under the old plan. For additional information on South Korea's work force, see Tables 6 and 7.

Most striking in the revised economic plan's projections were the substantially lower inflation forecasts. The GNP deflator, widely regarded as the most important inflation indicator, was rising at an annual rate of 2 percent at the end of 1986, as opposed to the 9.5 percent increase envisaged in the original plan.

Another major feature of the plan is the recognition that South Korea's dependence on external trade will have to fall, given the continued rise in protectionism evidenced by the country's trading partners. Merchandise exports in 1986 decreased from $53 billion to $34.7 billion. The domestic market will continue to give impetus to growth, as it has done in the past three years, when export growth has been relatively sluggish.

Table 8 shows South Korean imports and exports by its major trading partners and its balance of trade for the years 1982 through 1987. South Korea is a net exporter to the United States and increased its exports to the United States from $6.2 billion in 1982 to $18.3 billion in 1987. Imports from the United States have been held at a much lower growth, increasing only slightly from $6 billion in 1982 to $8.8 billion in 1987.

Table 5

Major Economic Indicators, History and Forecast—South Korea

	1962	1982	1983	1984	1985	1986*	1987*
GNP (US$M)	$2,315	$69,345	$75,998	$82,392	$83,684	$95,274	$118,600
Percent Growth	2.2%	5.6%	9.5%	7.7%	5.4%	12.3%	12.0%
Per Capita GNP (US$)	$ 87	$ 1,773	$ 1,914	$ 2,044	$ 2,047	$ 2,300	$ 2,826
Revenue (Billions of Won)	N/A	10,148	11,794	13,197	14,223	16,278	19,270
Expenditure (Billions of Won)	N/A	10,815	11,475	12,530	13,585	15,310	18,364
Exchange Rate (Won/US$)	257	749	796	827	890	860	792
WPI** (100 at 1980)	N/A	126.0	126.3	127.2	128.3	124.5	126.4
CPI# (100 at 1980)	N/A	130.1	134.5	137.6	141.0	144.6	148.2
National Savings Ratio	N/A	22.4%	24.4%	26.7%	28.1%	32.5%	32.8%
Total Investment to GNP	N/A	27.0%	27.6%	28.7%	29.1%	29.5%	29.7%
Debt (US$M)	$ 89	$37,200	$40,500	$43,100	$46,800	$44,500	$ 35,600
Debt to GNP	3.8%	52.5%	53.8%	53.2%	N/A	47.7%	38.7%

Note: N/A = Not Available; N/F = Not Forecast

*Estimated
**WPI = Wholesale Price Inflation
#CPI = Consumer Price Index

Source: South Korean Economic Planning Board

Table 6

Work Force Profile—South Korea
(Millions)

Sector	1983	1984	1985	1986	1987
Population over 15 Years Old	26.2	26.9	27.6	28.2	29.0
Economically Active Population*	15.1	15.0	15.0	16.1	16.9
Employment (All Industry)	14.5	14.4	15.0	15.5	16.4
Agro-Forestry and Fishery	4.3	3.9	3.7	3.7	3.6
Manufacturing, Mining,	3.3	3.5	3.7	4.0	4.6
Social Overhead, Other Services	6.8	7.0	7.6	7.8	8.2
Unemployment Level (Percent)	4.1%	3.9%	4.0%	3.8%	3.1%

*Individuals currently employed plus those actively seeking employment.

Source: The Bank of Korea

Table 7

Average Monthly Wages and Workdays
of Industrial Production Workers—South Korea
(US$)

	1983		1984		1985		1986		1987	
	Per Month		Per Month		Per Month		Per Month		Per Month	
	Wages	Work Days	Wages	Work Days	Wages	Work Days	Wages	Work Days	Wages	Work Days
All Industries	N/A	24.8	$302	25.0	$309	24.9	$349	25.0	$422	25.0
Electrical & Electronics	N/A	24.6	$293	24.4	$299	24.2	$346	24.0	$404	24.5

Source: The Bank of Korea

Table 8

Import/Export/Balance of Trade
History and Forecast—South Korea
(Millions of U.S. Dollars)

Geographic Segment	1982	1983	1984	1985	1986	1987
United States						
Export	$ 6,243	$ 8,245	$10,479	$10,754	$13,880	$18,311
Import	5,956	6,274	6,876	6,489	6,545	8,758
Balance	$ 287	$ 1,971	$ 3,604	$ 4,265	$ 7,335	$ 9,553
Japan						
Export	$ 3,388	$ 3,404	$ 4,602	$ 4,543	$ 5,426	$ 8,437
Import	5,305	6,238	7,640	7,560	10,869	13,657
Balance	($ 1,917)	($ 2,834)	($ 3,038)	($ 3,014)	($ 5,443)	($ 5,220)
Asia*						
Export	$ 4,856	$ 5,690	$ 5,906	$ 5,684	$ 5,760	$ 7,482
Import	6,693	6,535	6,940	6,633	4,973	6,807
Balance	($ 1,837)	($ 845)	($ 1,034)	($ 949)	$ 787	$ 675
Europe						
Export	$ 3,741	$ 3,803	$ 4,048	$ 4,297	$ 5,217	$ 7,849
Import	2,126	2,740	3,535	4,026	3,908	5,480
Balance	$ 1,615	$ 1,063	$ 513	$ 271	$ 1,309	$ 2,369
ROW						
Export	$ 3,625	$ 3,303	$ 4,210	$ 5,005	$ 4,431	$ 5,202
Import	4,171	4,405	5,641	6,428	5,289	6,318
Balance	($ 546)	($ 1,102)	($ 1,431)	($ 1,423)	($ 858)	($ 1,116)
Total						
Export	$21,853	$24,445	$29,245	$30,283	$34,714	$47,281
Import	24,251	26,192	30,631	31,136	31,584	41,020
Balance	($ 2,398)	($ 1,747)	($ 1,386)	($ 853)	$ 3,130	$ 6,261

Note: N/A = Not Available

*Excluding Japan

Source: South Korean Economic Planning Board, Office of Customs Administration Korea Foreign Trade Association

South Korea has been a net importer from Japan, importing $5.3 billion of goods in 1982 and exporting only $3.4 billion. This negative balance of trade with Japan has intensified in recent years as imports from Japan have risen faster than exports to Japan. The negative balance of trade of $1.9 billion in 1982 rose to $3 billion in 1985.

The Asian category of trading partners in Table 8 includes Taiwan, Hong Kong, Malaysia, the Philippines, Singapore, and India. The Asian group represents a larger bloc of trade with South Korea than does Japan and has a lower trade deficit. Europe represented a larger export market for South Korean products in 1982 and 1983 than Japan. However, in 1984, South Korean exports to Japan exceeded those to Europe by an estimated $554 million, and in 1987 this turnabout continued.

Increased South Korean interaction with U.S. markets over this period placed the United States at the top of South Korea's major export market at $18.3 billion in 1987. During 1984, the United States and Europe represented the only positive balance of trade partners for South Korea among the five regional trading partners.

Table 9 gives a historic picture of the increase of foreign direct investment in South Korea's economy.

Table 9

Foreign Direct Investment by Country—South Korea
(Millions of U.S. Dollars)

Total Investment	United States	Japan	Europe	Others	Total
1962-1985	$771.5	$1,370.6	$319.6	$203.2	$2,664.9
1962-1984	$662.4	$1,007.2	$270.9	$192.7	$2,133.2
1984	$191.0	$ 163.8	$ 49.8	$ 14.4	$ 419.0
1985	$109.1	$ 363.4	$ 48.7	$ 10.5	$ 531.7
1986	$125.1	$ 137.7	$ 63.4	$ 27.5	$ 353.7
1987	$255.1	$ 494.4	$210.0	$107.7	$1,060.2
1987 as a percent of total	22.1%	24.7%	35.4%	32.5%	26.0%

Source: South Korean Economic Planning Board

Demography and Economy--Taiwan

DEMOGRAPHY

Information pertaining to Taiwan's population growth and density and student population is given in Tables 1 through 3.

Table 1

POPULATION GROWTH--TAIWAN

End of Year	Number 1 (1,000 Persons) Total	Male	Female	Index 1981=100	Growth Rate %
1964	12,257	6,295	5,962	67.6	3.1%
1965	12,628	6,491	6,137	69.6	3.0%
1966	12,993	6,684	6,309	71.6	2.9%
1967	13,297	6,841	6,456	73.3	2.3%
1968	13,650	7,030	6,620	75.6	2.7%
1969	14,335	7,554	6,781	79.0	5.0%
1970	14,676	7,733	6,943	80.9	2.4%
1971	14,995	7,895	7,100	82.7	2.2%
1972	15,289	8,037	7,252	84.3	2.0%
1973	15,565	8,175	7,390	85.8	1.8%
1974	15,852	8,315	7,537	87.4	1.8%
1975	16,150	8,464	7,686	89.0	1.9%
1976	16,508	8,641	7,867	91.0	2.2%
1977	16,813	8,794	8,019	92.7	1.8%
1978	17,136	8,957	8,179	94.5	1.9%
1979	17,479	9,127	8,352	96.4	2.0%
1980	17,805	9,288	8,517	98.2	1.9%
1981	18,136	9,449	8,687	100.0	1.9%
1982	18,458	9,606	8,852	101.8	1.8%
1983	18,733	9,740	8,993	103.3	1.5%
1984	19,012	9,875	9,137	104.8	1.5%
1985	19,258	9,994	9,264	106.2	1.3%

Source: Ministry of the Interior, Taiwan

Table 2

POPULATION DENSITY--1985

Country	Area (Thousands of Square Miles)	Population (Millions)	People/ Square Mile
Taiwan	14	19.6	1,400

Source: Ministry of the Interior, Taiwan

Table 3

NUMBER OF STUDENTS BY LEVEL OF EDUCATION--TAIWAN

School Year	Total	Preschool Education	Nine-Year Free Education	Secondary Education	Higher Education	Other
1975	4,449,009	117,990	3,401,318	469,636	289,435	170,630
1976	4,478,957	121,373	3,400,238	480,280	299,414	177,607
1977	4,522,037	135,232	3,394,797	487,866	308,583	195,559
1978	4,529,663	151,290	3,360,800	490,613	317,188	209,722
1979	4,570,132	165,165	3,330,333	510,177	329,603	225,854
1980	4,597,765	178,216	3,309,238	530,035	342,528	237,704
1981	4,641,975	191,693	3,284,121	556,710	358,437	250,991
1982	4,724,921	193,744	3,309,057	581,285	375,696	265,139
1983	4,799,833	214,076	3,330,242	594,763	395,153	265,599
1984	4,870,838	234,172	3,351,122	600,192	412,381	272,971
1985	4,942,310	234,674	3,351,322	654,484	428,576	273,254

Source: Dataquest
March 1987

Demography and Economy--Taiwan

ECONOMY

Economic Overview

Taiwan, an island of about 14,000 square miles (roughly the size of Maryland and Delaware combined) with a population of about 19 million, is poor in natural resources but possesses a well-educated, hard-working labor force. One of the major success stories in economic development over the last 30 years, Taiwan maintained an average annual economic growth rate of 9.6 percent from 1960 through 1980. The worldwide recession in 1981 and 1982 slowed growth to between 3.3 and 5.7 percent, but Taiwan's economy rebounded to produce 7.9 percent growth in 1983 and 10.9 percent in 1984. However, GNP growth in 1985 slowed down to about 4.7 percent.

Foreign trade has often been called the lifeline of Taiwan's economy. It is indeed the driving force behind the country's sustained and rapid economic growth. With diversified marketing outlets and a wide range of products for export, Taiwan's exports, mainly electric and electronic items, textiles, footwear, and sporting goods, account for more than 50 percent of its GNP. In 1985, Taiwan experienced an economic slowdown that lowered domestic production, increased idle industrial capacity, and increased inventory stocks. Unemployment also increased to 2.8 percent (which does not take underemployment into account). Taiwan's exports increased 21 percent to $30.5 billion in 1984, but showed no increase during January to November 1985. (Unless otherwise specified, in-text currency references are to U.S. dollars.) Taiwan's purchases abroad, principally machinery and equipment, raw materials and agricultural commodities, amounted to $22 billion in 1984, up 8.3 percent from the previous year. In the first 11 months of 1985, Taiwan's imports decreased at an annualized rate of 8.6 percent to $18.4 billion. Taiwan attempts to protect domestic industries by employing both tariff and nontariff trade barriers so that U.S. pharmaceuticals, prepared foodstuffs, footwear, and apparel are not competitive there. Its total two-way trade surplus was $4.8 billion for 1983 and $8.5 billion for 1984. U.S. statistics calculate the U.S.-Taiwan trade deficit as $9.8 billion in 1984 and $10.0 billion in 1985.

Aware that Taiwan is losing its former advantage of cheap production costs to other developing economies, the authorities are attempting to restructure the economy toward more highly capitalized, technology-intensive industries such as telecommunications, electro-optics, and computers. To this end, a model science-industrial park was established at Hsinchu in 1980. At the end of November 1986, the park had 59 operating firms.

Taiwan also actively encourages foreign investment by offering tax and financial incentives to investors who upgrade existing industries, as well as to those investing in selected high-tech industries. New foreign investment approvals were up substantially to $559 million in 1984, reaching $640 million in 1985.

Taiwan has an excellent credit rating and finds it easy to obtain long-term foreign loans. The United States is its main source of long-term capital. Recently, there has been an outflow of capital, basically in reaction to high interest rates in the United States. Net foreign exchange holdings have been increasing steadily and currently amount to roughly $22 billion.

Taiwan maintains tight foreign exchange controls. Prices are stable at present. In fact, wholesale prices declined 2.8 percent from January through November 1985, and consumer prices fractionally increased in the same period. The major influences appear to be a decrease in the price of oil, which accounts for 17 to 20 percent of Taiwan's total imports, and sluggish demand by local and foreign markets.

Current Economic Status

Taiwan's economy continues the rapid expansion that began in the fourth quarter of 1985. Real GNP growth is accelerating, with an annual growth rate of nearly 7 percent for the first quarter of 1986 and 7.5 percent in the second quarter. Other economic indicators for the first two months of 1986 pointed in the same direction: exports increased 19.3 percent in February, the largest increase in 20 months; in January, orders received from abroad soared 20.3 percent to $3.1 billion, the highest level for a single month since 1981, when the authorities began compiling statistics on export orders; the industrial production index rose 6 percent from January 1985 levels and reached the highest level in 17 months; and some manufacturing firms report that industrial facility use rose from below 80 percent in late 1985 to nearly 90 percent in January 1986. For detailed information on Taiwan's economy, see Tables 4 through 8.

Table 4

MAJOR ECONOMIC INDICATORS,
HISTORY AND FORECAST--TAIWAN

	1962	1982	1983	1984	1985	1986*
GNP (US$M)	N/A	47,520	51,026	57,510	60,078	N/A
Percent Growth	N/A	6.9%	10.0%	11.4%	5.1%	N/A
Per Capita GNP	N/A	2,597	2,744	3,046	3,142	N/A
Revenue (NT$B)	N/A	476	506	548	573	N/A
Expenditure (NT$B)	N/A	513	505	564	527	N/A
Exchange Rate (NT$/US$)	N/A	39.9	40.3	39.5	39.9	36.0
WPI** (100 at 1981)	31.4	99.8	98.6	99.1	96.5	N/A
CPI# (100 at 1981)	25.3	103.0	104.4	104.3	104.2	N/A
National Savings Ratio	15.3%	30.1%	32.0%	33.4%	31.6%	N/A
Total Investment to GNP	15.1%	26.3%	23.1%	21.3%	19.1%	19.8%

Note: N/A = Not Available
* = Estimated
**WPI = Wholesale Price Inflation
#CPI = Consumer Price Index

Source: Directorate-General of Budget, Accounting and Statistics, Executive Yuan
Council for Economic Planning and Development

Table 5

IMPORT/EXPORT/BALANCE OF TRADE,
HISTORY AND FORECAST--TAIWAN
(Millions of U.S. Dollars)

Geographic Segment	1982	1983	1984	1985	1986**
United States					
Export	$ 8,758	$11,334	$14,868	$14,773	$15,200
Import	4,563	4,646	5,042	4,746	5,150
Balance	$ 4,195	$ 6,688	$ 9,826	$10,027	$10,050
Japan					
Export	$ 2,369	$ 2,477	$ 3,186	$ 3,461	N/A
Import	4,780	5,587	6,442	5,549	N/A
Balance	$(2,411)	$(3,110)	$(3,256)	$(2,088)	N/A
Asia*					
Export	$ 3,679	$ 4,006	$ 4,449	$ 4,895	N/A
Import	1,692	1,821	2,264	2,147	N/A
Balance	$ 1,987	$ 2,185	$ 2,185	$ 2,748	N/A
Europe					
Export	$ 2,590	$ 2,761	$ 3,064	$ 2,985	N/A
Import	2,116	2,270	2,380	2,242	N/A
Balance	$ 474	$ 491	$ 674	$ 743	N/A
Row					
Export	$ 4,808	$ 4,545	$ 4,889	$ 4,609	N/A
Import	6,737	5,963	5,831	5,418	N/A
Balance	$(1,929)	$(1,418)	$ (932)	$ (809)	N/A
Total					
Export	$22,204	$25,123	$30,456	$30,723	$32,420
Import	19,888	20,287	21,959	20,102	21,850
Balance	$ 2,316	$ 4,836	$ 8,497	$10,621	$10,570

Note: N/A = Not Available
*Excluding Japan
**Estimated by CEPD

Source: Minister of Finance
Council for Economic
Planning and Development

Demography and Economy--Taiwan

Table 6

KEY ECONOMIC INDICATORS, 1985--TAIWAN
(Millions of U.S. Dollars except for Per Capita GNP)

Estimated National Income Data	1984	1985	% Change
GNP at Current Prices*	$ 57,510	$ 60,078	5.14%
GNP at Constant 1981 Prices*	$ 54,105	$ 56,302	4.73%
Fixed Capita Formation (1981 Prices*)	$ 12,279	$ 11,538	(5.42%)
Per Capita GNP at Current Prices (US$)*	$ 3,046	$ 3,142	3.75%
GNP Deflator (1981=100)	$ 106.29	$ 106.71	0.40%
Trade			
F.O.B. Exports	$ 30,456.4	$ 30,716.8	0.85%
C.I.F. Imports	$ 21,959.1	$ 20,106.6	(8.44%)
Trade Balance	$ 8,497.3	$ 10,610.2	24.97%
Export Price Index	$ 100.34	$ 100.20	(0.14%)
Import Price Index (1981=100)	$ 95.59	$ 93.96	(1.71%)
Exports to U.S.	$ 14,867.7	$ 14,770.3	(0.66%)
Imports from U.S.	$ 5,041.7	$ 4,746.5	(5.86%)
Trade Balance with U.S.	$ 9,826.0	$ 10,023.8	2.01%
Prices and Unemployment			
Wholesale Price Index (1981=100)	$ 99.11	$ 96.54	(2.59%)
Consumer Price Index (1981=100)	$ 104.33	$ 104.16	(0.16%)
Unemployment	2.44	2.90	N/A
Investment and Key Production Data			
Foreign Investment Approvals	$ 558.74	$ 621.46	25.72%
U.S. Investment Approvals	$ 241.25	$ 320.64	41.20%
Industrial Production Index (1981=100)	$ 127.21	$ 128.75	2.21%
Power Generation (million KWH)	$ 49,387	$ 52,553	6.63%
Cotton Fabrics (million meters)	$ 607	$ 623	2.55%
Man-Made Fibers (MT)	$ 970,419	$1,033,451	6.50%
Polyvinyl Chloride (MT)	$ 634,445	$ 633,129	(0.21%)
Petrochemical Feed Stocks (MT)	$1,847,181	$2,048,153	10.88%
Chemical Fertilizers (1,000 MT)	$ 1,118	$ 1,062	(5.00%)
Cement (1,000 MT)	$ 14,234.4	$ 14,417.8	1.29%
Steel Bars and Structurals (1,000 MT)	$ 5,627	$ 5,529	(1.75%)
Automobiles	$ 171,214	$ 159,639	(6.76%)
Crude Oil Refined (1,000 KL)	$ 20,193.0	$ 20,008.8	(0.91%)
Television Sets (1,000 Units)	$ 5,165.0	$ 3,664.7	(29.05%)

Note: N/A = Not Available

*Growth rates calculated on basis of NT dollar value.

Source: Council for Economic Planning and Development

Table 7

KEY ECONOMIC INDICATORS, FEBRUARY 1986--TAIWAN
(Millions of U.S. Dollars except for Exchange Rates)

	February 1985	January 1986	February 1986	% Over February 1985	% Over January 1986
Trade					
F.O.B. Exports	$ 2,105.20	$ 3,097.50	$ 2,290.40	8.08%	(26.06%)
C.I.F. Imports	$ 1,284.00	$ 1,838.30	$ 1,531.30	19.26%	(16.70%)
Trade Balance	$ 821.20	$ 1,259.20	$ 795.10	(7.59%)	(39.71%)
Export Price Index (1981 = 100)	98.97	98.98	98.07	(0.91%)	(0.92%)
Import Price Index (1981 = 100)	93.33	93.43	92.69	(0.69%)	(0.79%)
Unofficial Exchange Rate (NT$ per US$1)	41.00	39.40	$ 39.35	(4.02%)	(0.13%)
Official Exchange Rate (NT$ per US$)	39.28	39.31	$ 39.09	(0.48%)	(5.60%)
Exports to United States	$ 984.20	$ 1,548.30	$ 1,102.22	11.99%	(28.81%)
Imports from United States	$ 330.20	$ 416.20	$ 363.10	9.96%	(12.76%)
Trade Balance with United States	$ 654.00	$ 1,132.10	$ 739.10	13.01%	(34.71%)
Money, Interest, Prices, and Unemployment					
Money Supply (M-1)*	$ 17,691.00	$ 20,220.00	$ 20,159.00	13.40%	(0.86%)
Net Foreign Assets	$ 20,905.00	$ 30,584.00	$ 31,403.00	50.22%	2.10%
Wholesale Price Index (1981 = 100)	97.45	95.33	95.26	(2.25%)	(0.07%)
Consumer Price Index (1981 = 100)	104.82	102.75	103.27	(1.48%)	(0.51%)
Unemployment Rate	2.15	2.53	$ 3.33	54.88%	31.62%
Investment and Key Production Data					
Foreign Investment Approvals	47.61	38.47	$ 44.35	(6.47%)	15.75%
U.S. Investment Approvals	38.95	4.33	$ 0.33	(99.15%)	(92.38%)
Industrial Production Index (1981 = 100)	106.78	139.95	110.03	3.04%	(21.38%)
Power Generation (Million kWH)	3,307	4,430	3,592	8.62%	(18.92%)
Cotton Fabrics (Million Meters)	42	51	45	7.42%	(12.30%)
Manmade Fibers (MT)	$ 75,453.00	$137,770.00	$125,810.00	66.74%	(8.68%)
Polyvinyl Chloride (MT)	$ 44,087.00	$ 66,085.00	$ 66,304.00	50.39%	0.33%
Petrochemical Feed Stocks (MT)	$160,415.00	$194,694.00	$163,076.00	1.66%	(16.24%)
Chemical Fertilizers (1,000 MT)	$ 43.00	$ 105.00	$ 97.00	125.23%	(7.24%)
Cement (1,000 MT)	$ 1,010.10	$ 1,238.10	$ 847.40	(16.11%)	(31.56%)
Steel Bars and Structurals (1,000 MT)	$ 367.00	$ 523.00	$ 446.00	21.39%	14.79%
Automobiles	$ 10,328.00	$ 15,529.00	$ 8,849.00	(14.32%)	(43.02%)
Crude Oil Refined (1,000 KL)	$ 1,586.80	$ 1,524.00	$ 1,487.30	(6.27%)	(2.54%)
Television Sets (1,000 Units)	280.90	321.60	239.40	(14.77%)	(25.56%)

*M-1 growth rate calculated on basis of current NT dollar value.

Source: Ministry of Economic Affairs

Table 8

SELECTED ECONOMIC DATA, MARCH 1986--TAIWAN

	1983		1984		1985	
Merchandise Trade						
Export--CBC Statistics	$25,687		$31,103		$31,383	
Import--CBC Statistics	20,445		22,189		20,596	
Trade Balance	$ 5,242		$ 8,824		$10,789	
Major Trading Partners (US$M)						
Two-Way Trade--Total						
(Customs Statistics)	$45,402		$52,420		$50,822	
United States	15,979		19,912		19,516	
Japan	8,065		9,631		9,014	
Hong Kong	1,942		2,458		2,859	
West Germany	1,543		1,636		1,651	
Saudi Arabia	2,686		2,699		1,951	
Others	15,187		16,084		15,831	
Trade Balance--Total						
(Customs Statistics)	$ 4,833		$ 8,494		$10,610	
United States	6,686		9,827		10,024	
Japan	(3,109)		(3,258)		(2,095)	
Hong Kong	1,345		1,717		22,220	
West Germany	159		100		(41)	
Saudi Arabia	(1,165)		(1,244)		(771)	
Others	971		1,352		1,283	
Major Export Items (US$M)						
Electrical and Electronic Products	$ 4,851	(1)	$ 6,578	(1)	$ 6,448	(1)
Textile Products	$ 4,599	(2)	$ 5,675	(2)	$ 5,743	(2)
Machinery and Metal Products	$ 2,322	(3)	$ 2,883	(3)	$ 3,007	(3)
Footwear	$ 1,923	(4)	$ 2,321	(4)	$ 2,385	(4)
Plastics and Plastic Products	$ 908	(7)	$ 1,246	(6)	$ 1,453	(5)
Transportation Equipment	$ 1,023	(6)	$ 1,207	(7)	$ 1,262	(6)
Plywood and Wood Products	$ 1,241	(5)	$ 1,285	(5)	$ 1,261	(7)
Basic Metals	$ 694	(8)	$ 736	(8)	$ 761	(8)
Refined Petroleum Products	$ 448	(9)	$ 541	(9)	$ 528	(9)
Fish Products	$ 285	(10)	$ 288	(10)	$ 287	(10)
Major Import Items (US$M)						
Crude Petroleum	$ 4,094	(1)	$ 3,767	(1)	$ 3,337	(1)
Machinery and Metal Products	$ 2,228	(3)	$ 2,328	(3)	$ 2,797	(2)
Basic Metals	$ 1,772	(5)	$ 2,220	(4)	$ 2,021	(3)
Chemicals	$ 1,850	(4)	$ 2,036	(5)	$ 1,931	(4)
Electrical and Electronic Products	$ 2,361	(2)	$ 3,152	(2)	$ 1,914	(5)
Food, Beverages, and Tobacco Products	$ 783	(7)	$ 888	(6)	$ 872	(6)
Transportation Equipment	$ 1,001	(6)	$ 641	(7)	$ 758	(7)
Raw Cotton and Synthetic Fiber	$ 412	(10)	$ 525	(8)	$ 465	(8)
Maize	$ 490	(8)	$ 476	(9)	$ 423	(9)
Lumber	$ 463	(9)	$ 434	(10)	$ 313	(10)

(Continued)

Table 8 (Continued)

SELECTED ECONOMIC DATA, MARCH 1986--TAIWAN

	1983	1984	1985
Government Budget (US$B)			
Revenue	$ 13.37	$ 13.05	$ 14.45
Expenditures	13.99	13.02	14.44
Surplus (Deficit)	($ 0.62)	($ 0.03)	($ 0.01)
Gross National Product (US$B)			
GNP (Current Prices)	$ 49.86	$ 56.06	$ 59.86
Real GNP (1981 Prices)	$ 48.47	$ 53.76	$ 56.11
Exports/GNP	51.5%	55.3%	54.2%
Per Capita Income (US$)			
Current Prices	$ 2,444	$ 2,755	$ 2,868
Industrial Production (Index 1981 = 100)			
General Index	113.36	127.46	141.79
Mining	87.00	84.46	81.62
Manufacturing	116.95	132.25	146.99
Public Utilities	113.21	121.20	127.76
Building Construction	64.46	70.11	90.25
Foreign Investment (US$M)			
Cumulative Foreign Investment	$ 3,898	$ 4,457	$ 5,160
New Foreign Investment by Origin			
Overseas Chinese	$ 29	$ 40	$ 42
United States	93	231	333
Japan	197	114	145
Europe	21	92	100
Others	65	82	83
	$ 405	$ 595	$ 703
Labor (US$)			
Monthly Manufacturing Earnings (Excluding Staff Employees)	$ 253	$ 294	$ 284
Money and Finance	December	December	December
Unofficial NT$ Exchange Rate NT$:US$	$ 41.60	$ 41.53	$ 40.17
Six Month Commercial Paper Rate (%)	7.54%	7.27%	5.75%
Unsecured NT$ Lending Rate (%)	10.25%	10.00%	9.50%
Secured NT$ Lending Rate (%)	10.25%	10.00%	9.50%
Bank Liquidity--Excess Reserves (NT$B)	$ 3.13	$ 3.49	$ 7.15
Money Surplus (NT$B)	$ 616.16	$ 669.37	$ 751.27
Money Supply (M1) Growth Rate (%)	18.10%	8.64%	12.24%
Net Foreign Exchange Reserves (US$B)	$ 13.80	$ 19.37	$ 29.22
Net Foreign Exchange Reserves to Import (Months)	8.10	10.48	17.03
Prices (Index 1981 = 100)			
Wholesale Prices	98.85	98.26	95.35
Urban Consumer Prices	102.24	203.94	102.56

Source: Irving Trust Company, Taipei Branch

Stimulating this growth is Taiwan's government policy of private enterprise and free trade that encourages broader participation of private businesses in global marketing activities and a strengthening of bilateral trade relations. Several other factors have contributed to the improvements in the economy as well. The previously mentioned decline in oil prices has benefited Taiwan, which imports virtually all of its oil supplies. Following the renegotiation of its contracts with Saudi Arabia and Kuwait, Taiwan authorities announced reductions in petroleum product prices. In anticipation of reduced production costs, particularly for industries heavily affected by petroleum prices, and growth of consumer demand as disposable income increases, orders from abroad have expanded. Also, the declining value of the U.S. dollar, to which the NT dollar is tied, has made Taiwan's exports more competitive in European and Japanese markets, and orders have been flooding manufacturers.

Prices continue to be stable, with the wholesale price index dropping 2.7 percent and consumer price index declining 1.2 percent from January 1985 levels. However, inflationary pressure continues to mount, primarily from two forces--the buildup of foreign exchange reserves and implementation of the Value-Added Tax (VAT). Outstanding foreign assets at the end of January 1986 totaled $30.6 billion. While the decline in oil prices has offset some price increases caused by the VAT, the new tax has caused some inflation.

The continued growth of foreign assets--at an average rate of almost $1 billion per month--has caused the money supply to expand much more rapidly than the authorities would like. In January 1986, the growth rate calculated on the basis of the current NT dollar value was increasing at an annual rate of 20 percent, and idle cash was flooding the banking community. Many banks refused to accept large deposits, and the postal savings system set a limit of NT$500,000 for individual time deposits. In an effort to soak up some of this liquidity, the authorities issued record numbers of public bonds and authorized several banks to invest funds in foreign capital markets on behalf of interested depositors.

An unexpected outlet for idle funds has been the Taiwan Stock Exchange. The number of first-time investors in the stock market increased by 50 percent during the first few months of 1986. In early March 1986 the stock index hit a new high of 978 (the base year is 1966), and volume hit an all-time high of NT$3.613 billion (US$90.3 million). All stocks seem to have been benefiting from the buying spree, regardless of the underlying value of the company--of the 28 companies whose trading was halted on March 4, 1986, because share prices had risen by the maximum allowable amount, 26 had experienced financial difficulties in 1985.

Demography and Economy--Taiwan

Recent Economic History

Taiwan's high level of economic growth began with a highly successful land reform program and an import-substitution drive in the 1950s. This was followed by a sustained export boom in the 1960s, which accelerated Taiwan's overall pace of economic growth.

The pace of economic development was so fast that in the beginning of the 1970s, bottlenecks started to build up in several areas, notably transportation and the basic industries that supplied essential industrial raw materials and intermediates.

Economic Development Phase I: 1945-1952

After the end of the Second World War, Taiwan's economy was in turmoil. Commodity prices skyrocketed by as much as 330 percent a year. With a rapid population increase came an extremely serious unemployment problem. Efforts at this time were directed at building up a normal economy from the ruins, boosting agricultural and industrial production, and stabilizing commodity prices.

Economic Development Phase II: 1953-1960

The year 1953 was a milestone in Taiwan's economic development. That year, when the government launched its first Four-Year Economic Development Plan, Taiwan's foreign trade totaled only $320 million. In the first two Four-Year Plans, agriculture was on top of the development priorities, and foreign trade stayed at a third of a billion dollars throughout the 1950s.

Economic Development Phase III: 1961-1972

The third, fourth, and fifth Four-Year Economic Development Plans occurred during this period. Labor-intensive and export-oriented industries began to grow by leaps and bounds, moving more aggressively into the world market. In 1965, Taiwan's external trade broke the $1 billion mark, and by 1970 it had soared to more than $3 billion. Since 1971, the pace of trade growth has further accelerated, and the trade balance has turned in Taiwan's favor.

Economic Development Phase IV: 1973-1980

During this period, the sixth Four-Year Economic Development Plan was implemented. Continuing its previous high growth rate, Taiwan's economic growth in 1973 was 12.8 percent. In the decade ending in 1980, except for two brief periods of trade deficit during the 1974 and 1975 world economic turmoils, Taiwan has enjoyed comfortable trade surpluses year after year.

Demography and Economy--Taiwan

<u>The 10 Construction Projects</u> -- Taiwan embarked upon 10 major construction projects in 1973 to eliminate bottlenecks caused by its rapid economic development and to prepare itself for a new stage of economic development.

Of these projects, six were to improve transportation; three to promote heavy and petrochemical industries; and one to develop the power industry. Following are brief descriptions of these projects:

- The Sun Yat-sen Memorial Freeway--This 373-kilometer expressway is the first ever built in Taiwan.
- North Link Railroad--Linking Nanshenghu and Tienpu, the 81.6-kilometer North Link Railroad helps to develop eastern Taiwan.
- Railroad electrification--The West Coast Railway Trunk Line was converted to electric power, which greatly reduced travel time.
- Chiang Kai-shek International Airport--Located in Taoyuan, 27 kilometers southwest of Taipei, the airport is designed to meet Taiwan's air traffic needs for the next 30 years.
- Taichung Port--This artificial port was built on a sandy area on Taiwan's west coast. In addition to meeting the shipping and fishing needs of central Taiwan, Taichung Port relieves other heavily used ports.
- Suao Harbor--This east coast harbor increases Taiwan's cargo-handling capacity and promotes the shipping and fishing industries in eastern Taiwan.
- Integrated Steel Mill--The China Steel Corporation's mill in Kaohsiung, Taiwan's first modern steel mill, is expected to boost the development of related industries, such as shipbuilding and machinery and automobiles manufacturing.
- Kaohsiung Shipyard--This giant shipyard, located next to the steel mill, has an annual shipbuilding capacity of 1.5 million tons and a repair capacity of 2.5 million tons.
- Petrochemical complex--In the Kaohsiung area, the state-run Chinese Petroleum Corporation has three naphtha crackers to supply upstream materials for the petrochemical industry. Two large complexes were also built near Kaohsiung to produce various petrochemical intermediates.

Demography and Economy—Taiwan

- Nuclear power plant--This project diversifies Taiwan's electrical power sources and reduces its dependence on oil imports. The two units of the first nuclear power plant, each with a capacity of 636,000 kilowatts, have been completed and put into commercial operation. Two more nuclear power plants are being built under Taiwan's new series of 12 development projects.

<u>The 12 New Development Projects</u> - The 10 major construction projects, started in 1973, were completed in early 1980 at a total cost of $8 billion. Shortly before their completion, 12 new projects were undertaken. These projects differ from the original 10 in that they emphasize agricultural, social, and cultural development in addition to industrial and infrastructure buildup.

- Around-the-Island Railroad--Upon completion of this three-part project, a trip around the island will take only a day and will assuredly become a major tourist attraction. It will also make the east coast more accessible, service Hualien Harbor, and provide an alternative to the present western main rail line.

- New cross-island highways--These three highways, totaling 287 kilometers, will cost NT$8.6 billion and are scheduled for completion by June 1990. The new highways will shorten the traffic distance across Taiwan; provide easier access to the natural resources in the Central Range region, where reserves of limestone, dolomite, quartz, and natural gas are abundant; and spur tourism by making Taiwan's beautiful Central Range more accessible.

- Kao-ping region traffic improvement--This project, completed in 1984, improves traffic conditions in the Kaohsiung-Pingtung region, which has changed from an agricultural area into a highly industrialized region in recent years. At present, about 1,600 hectares of land are developed or ready to be developed for industrial use.

- China Steel expansion--This expansion project is to ensure Taiwan a steady supply of steel products and to help the development of related industries. Its estimated cost is NT$55.5 billion.

Demography and Economy--Taiwan

- Nuclear power project--Taiwan's second nuclear power plant was put into operation in March 1983. Its two boiling-water generating units have a combined capacity of 1.97 million kilowatts.

  The third nuclear power plant, completed in 1985, features two pressurized water reactors and a combined capacity of 1.902 million kilowatts.

  As with the first nuclear power plant, these plants increase power generation, diversify Taiwan's energy sources, and reduce its dependence on oil imports. By 1985, the Taiwan Power Company had an installed capacity of 15,827 megawatts, with 32.5 percent from nuclear facilities, 52.1 percent from thermal plants relying on oil or coal, and 15.4 percent from hydroelectric installations.

- Taichung Port--This port now has 27 wharves and an annual cargo-handling capacity of 11 million revenue tons. With navigation courses 14 meters below low-tide water level, Taichung Port can now accommodate 60,000-ton ships.

- New towns and housing projects--Taiwan's industrial and population centers have grown up near northern and southern ports. Population concentrations have aggravated traffic congestion, pollution, and housing supply. To reduce the population pressure in existing metropolitan areas, the government has worked out long-term plans for development of mountain and hillside regions. In line with this policy, the government will develop satellite towns near Taipei, Taichung, and Kaohsiung by 1996.

  To improve low-income housing, the government passed a public housing act in July 1975 and soon afterward started large-scale public housing construction. Under this project, the government has thus far provided 105,225 public housing units for low-income families. The total investment in this area will reach NT$111 billion.

Demography and Economy--Taiwan

- Regional drainage--Because Taiwan has heavy rains and typhoons, flooding frequently damages farmland and reduces production. There are 490,000 hectares of farmland in Taiwan with drainage facilities, but 87,700 hectares of this land require drainage improvement. To assure production in important agricultural areas, the government has launched regional drainage improvement projects expected to increase annual rice, sugar cane, and sweet potato yields. Also, in response to frequent rice gluts and shortages of other foodstuffs, the government is actively guiding the farmers to plant crops other than rice. In the second stage of farmland reform now under way, the government encourages large-scale farming operations and cooperative farming to replace present small-size operations.

- Dike and levee construction--Sea dikes and river levees are needed to protect nearly 65,000 hectares of coastal land and 432,000 hectares of land along rivers and streams from floods. Under this project, completed dikes and levees will protect about 55,300 hectares of farmland, about 2,300 hectares of fish ponds, and 990 kilometers of roads.

- Pingtung-Oluanpi Highway widening--This project, completed in 1983 at a cost of NT$3.6 billion, significantly improves transportation in southern Taiwan and enhances regional tourism and industrial development.

- Farm mechanization--The government has been encouraging farm mechanization since the start of the 1970s, and present programs call for an additional 150,000 farm machines and the establishment of new farm machinery plants. These projects are expected to produce annual intangible benefits worth NT$4 billion (about US$100 million) and offset the 1.5 percent annual loss of the agricultural labor force.

- Cultural centers--To preserve and enrich cultural development and the Chinese heritage, all cities and counties are to have their own libraries; and some, their own music halls and regional museums. City and county cultural centers are to reflect local characteristics and meet regional needs.

The 14 Key Projects - The 14 key projects proposed by the Executive Yuan will require an estimated outlay of NT$800 billion (US$20 billion); if everything goes well, most will have been completed by 1990. They are as follows:

- Third-phase expansion of the China Steel Corporation--This will allow an additional 2,402 million metric tons of crude steel to be produced annually, bringing total capacity to 5,652 million metric tons.

- Power projects--These include a fourth nuclear power plant, the Mingtan pump storage project, and a thermal power plant in Taichung.

- Oil and natural gas--This includes renovation of naphtha crackers and construction of a receiving terminal to handle imports of liquefied natural gas.

- Modernization of telecommunications--Included are urban and rural telecommunication services and telecommunication networks.

- Railway system expansion--The project calls for the completion of the South Link Railroad (an extension of the 12 projects) and widening the railway between Kaohsiung and Pingtung.

- Highway expansion--Included are a second freeway in northern Taiwan and two north-south highways.

- Underground railroad in downtown Taipei--This encompasses construction of a main station and tunnels with ramps connecting two other stations, elimination of 13 level crossings, and construction of a coach yard and an adjacent station.

- Initial phase, Taipei metropolitan area mass rapid transit system--This route is 34.9 kilometers long, with 33 stations.

- Flood control and drainage--This implements follow-up flood control in the Taipei area; continuation of river levee and sea dike construction; carryover of regional drainage projects; and watershed protection and flood control.

- Exploitation of water resources--This project involves three reservoirs.

- Ecological protection and domestic tourism--The four national parks at Yushan, Taroko, Kenting, and Yangmingshan, and the coastal scenic area of northeastern Taiwan are to be further developed.

- Municipal solid waste disposal--This long-term plan will improve and upgrade environmental quality.

- Medical care programs--The plan calls for improvement of the National Taiwan University Medical School and its affiliated hospital; improvement of the Veterans General Hospital and establishment of its Kaohsiung branch; establishment of a medical school and an affiliated hospital at National Cheng Kung University; and establishment of grass-roots medical facilities, including 100 group medical-practice centers.

- Grass-roots development projects--First launched in 1980, this program calls for an average annual expenditure of NT$12.6 billion to narrow the gap between city and countryside development and to improve rural living conditions. Small engineering projects and miscellaneous public works have been implemented under the program.

Economic Analysis

A closer look into Taiwan's trade picture shows that the change in its export composition reflects an accelerated pace of industrialization. In 1952, industrial products accounted for only 8 percent of Taiwan's exports, whereas now they account for 93.9 percent. On the other hand, processed agricultural products and agricultural products have dropped to 4.5 percent and 1.6 percent, respectively.

With imports, Taiwan has made wise use of its hard-earned foreign exchange. Most of the money (92.5 percent of total imports) is spent on purchases of capital equipment and agricultural and industrial raw materials, which are essential to the economy. In 1984, imports of consumer goods amounted to $1.6 billion (7.5 percent of total imports), also a record high, reflecting the improved standard of living.

Export promotion is regarded as a very important task of the Taiwan government and business community. Every effort has been made to strengthen the nation's trade relations with other countries.

Trade offices have been set up in almost every corner of the globe, far outnumbering official diplomatic representations. Expanded trade with Europe, the Middle East, and Latin America, in addition to such traditional markets as the United States and Japan have been called for.

Beginning in early 1980, the government gave the green light to direct trade with five Eastern European Communist states: Yugoslavia, Czechoslovakia, Poland, Hungary, and East Germany. This is a departure from Taiwan's long-standing policy of not trading with any Communist state.

Demography and Economy--Taiwan

The Taiwanese government is also taking steps to push further its free trade policy. Red tape for import-export business has been further reduced. Import tariffs are being cut down gradually and continuously.

The nominal average tariff rate has been cut down from 39.14 percent of fiscal year 1979 to 26.46 percent of fiscal year 1985. Tariffs on 1,058 items were lowered in 1985. This is only a part of the government's plan to lower the nation's nominal tariff rate to 20 percent by 1989.

Another important scheme, recently adopted, is a two-tier tariff system, which enables the nations that have extended most-favored-nation status to Taiwan to enjoy preferential tariff rates.

The nation's two-way trade grew 15 percent to reach $52.4 billion in 1984, with a surplus of $8.5 billion. This excellent performance, a record for the past 30 years, has ranked Taiwan as the 16th largest supplier in exports as well.

Taiwan shipped $30.5 billion worth of products abroad in 1984, up 21.2 percent from a year earlier. However, exports started declining in August of 1985. Export growth rates dropped to 4.8 percent and 2.6 percent in November and December 1985, respectively.

In terms of imports, the nation registered a growth rate of only 8.3 percent, amounting to $22.0 billion in 1984. The situation was less satisfactory during the second half of the year, with growth rates decreasing by 3.9 percent in November and 13.9 percent in December. The growth rate of imports was lower than that of exports, indicating that local manufacturers were less willing to invest.

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Demography and Economy--Hong Kong

DEMOGRAPHY

With a land area of 1,071 square kilometers and a population of 5.7 million persons, Hong Kong is one of the most densely populated places in the world.

At year-end 1987, Hong Kong's population density was 5,262 people per square kilometer. Of course, this figure is an average and conceals wide variations among different areas in the territory. According to the 1986 census, the population density of the metropolitan areas—Hong Kong Island, Kowloon, New Kowloon, and Tsuen Wan—was 20,811 people per square kilometer, whereas that of the New Territories was 1,449 per square kilometer. This distribution will change with the continuing development of new towns in the New Territories, designed to alleviate the high density in the urban areas and to provide better housing and an improved living environment.

The total 1987 population—comprising 2.9 million males and 2.8 million females—represent an average annual increase of 2.0 percent since 1977.

The age distribution of the population has changed significantly since 1977. In 1977, 29.0 percent of the population was under 15 years of age; in 1987, the figure had dropped to 22.6 percent. The proportion of people aged 65 and over rose from 5.7 percent in 1977 to 8.0 percent in 1987. In accordance with these changes, the proportion of working-age people (15-64) increased from 65.3 percent in 1977 to 69.4 percent in 1987. The dependency ratio—the ratio of the people under age 15 plus people 65 and over to people aged 15-64—has dropped from 531 per thousand in 1977 to 440 per thousand in 1987.

The ratio of males to females showed only a slight increase, from 1,052 males per 1,000 females in 1977 to 1,054 males per 1,000 females in 1987.

The 1986 census indicated that 59.3 percent of the population was born in Hong Kong. Most of these people have their family origins in Guangdong Province. Individuals with their origins in Guangzhou, Hong Kong, Macao, and adjacent areas form the largest community, followed by the Siyi and Chaozhou groups.

The estimated number of non-Hong Kong Commonwealth citizens residing in Hong Kong at the end of 1987 was 67,900. Their composition is summarized in Table 1. The estimated number of non-Commonwealth residents in Hong Kong at the end of 1987 was 104,300. Their composition is summarized in Table 2. Hong Kong's vital statistics are summarized in Table 3.

Table 1

Composition of Non-Hong Kong Commonwealth Population

Nationality	Persons	Total
Indian	15,800	23.3%
British	14,100	20.8
Malaysian	10,200	15.0
Canadian	9,100	13.4
Australian	8,800	13.0
Singaporean	5,300	7.8
Other Commonwealth Nationals	4,600	6.8
Total	67,900	100.0%

Note: Columns may not add to totals shown because of rounding.

Source: Hong Kong Government

Table 2

Composition of Non-Commonwealth Residents in Hong Kong

Nationality	Persons	Total
Filipino	39,100	37.5%
American	14,700	14.1
Thai	10,100	9.7
Japanese	8,500	8.1
Pakistani	7,700	7.4
Portuguese	7,600	7.3
Indonesian	3,300	3.2
Korean	2,600	2.5
German	1,600	1.5
French	1,500	1.4
Dutch	1,200	1.2
Other Nationalities	6,400	6.1
Total	104,300	100.0%

Source: Hong Kong Government

Table 3

Hong Kong
Vital Statistics

	1985	1986	1987
Estimated Midyear Population	5.5 Million	5.5 Million	5.6 Million
Births			
Known Live Births	76,126*	71,620*	69,811
Crude Birth Rate (per 1,000 Population)	14.0	13.0	12.5
Deaths			
Known Deaths	25,258	25,912*	26,886
Crude Death Rate (per 1,000 Population)	4.6	4.7	4.8
Infant Mortality Rate** (per 1,000 Live Births)	7.6	7.7*	7.5
Neonatal Mortality Rate** (per 1,000 Live Births)	5.0	5.3	4.8
Maternal Mortality Rate** (per 1,000 Total Births)	0.05	0.03	0.04

*Revised figures
**Based on registered deaths

Source: Hong Kong Government

STRUCTURE AND DEVELOPMENT OF THE ECONOMY

The relative importance of the various economic sectors can be assessed in terms of their contributions to the gross domestic product (GDP) and to total employment (see Table 4).

Primary production (comprising agriculture, fishing, and mining) is small in terms of its contribution to the GDP and employment.

Working on a very small agricultural base, Hong Kong's farmers produce foods that primarily serve local preferences for fresh, rather than frozen or chilled, foods. No locally produced foods are generally higher in quality than the same type of imported foods and thus command higher prices. They also provide Hong Kong with some degree of self-sufficiency in its supply of highly perishable foodstuffs.

Table 4

Contribution of Economic Sectors to GDP

	1984		1985	
	HK$ Millions	Percent	HK$ Millions	Percent
Sector				
Agriculture and Fishing	HK$ 1,273	0.5%	HK$ 1,238	0.5%
Mining and Quarrying	299	0.1	385	0.2
Manufacturing	55,535	24.1	53,071	21.9
Electricity, Gas, and Water	5,687	2.5	6,665	2.7
Construction	12,218	5.3	12,038	5.0
Wholesale and Retail, Import/Export Trades, Restaurants and Hotels	51,117	22.2	52,831	21.8
Transport, Storage, and Communication	17,958	7.8	19,677	8.1
Financing, Insurance, Real Estate, and Business Services	36,526	15.9	39,589	16.3
Community, Social, and Personal Services	36,549	15.9	41,979	17.3
Ownership of Premises	24,855	10.8	26,672	11.0
Nominal Sector (Adjustment for Financial Services)	(11,725)	(5.1)	(11,722)	(4.8)
GDP at Factor Cost (Production-Based Estimate)	HK$230,292	100.0%	HK$242,423	100.0%
Indirect Taxes Less Subsidies	HK$ 9,894		HK$ 12,333	
GDP at Market Prices (Production-Based Estimate)	HK$240,186		HK$254,756	
GDP at Market Prices (Expenditure-Based Estimate)	HK$248,728		HK$261,195	
Statistical Discrepancy (Percent)	(3.4%)		(2.5%)	

(Continued)

Table 4 (Continued)

Contribution of Economic Sectors to GDP

	1986*	
	HK$ Millions	Percent
Sector		
Agriculture and Fishing	HK$ 1,333	0.5%
Mining and Quarrying	342	0.1
Manufacturing	62,252	21.9
Electricity, Gas, and Water	8,385	3.0
Construction	12,758	4.5
Wholesale and Retail, Import/Export Trades, Restaurants and Hotels	62,266	21.9
Transport, Storage, and Communication	24,011	8.4
Financing, Insurance, Real Estate, and Business Services	48,330	17.0
Community, Social, and Personal Services	47,926	16.8
Ownership of Premises	29,951	10.5
Nominal Sector (Adjustment for Financial Services)	(12,971)	(4.6)
GDP at Factor Cost (Production-Based Estimate)	HK$284,583	100.0%
Indirect Taxes less Subsidies	HK$ 14,750	
GDP at Market Prices (Production-Based Estimate)	HK$299,333	
GDP at Market Prices (Expenditure-Based Estimate)	HK$299,826	
Statistical Discrepancy (Percent)	(0.2%)	

*Provisional estimates

Source: Hong Kong Government

Only about 9 percent of the total land area is suitable for crop farming, and about 2 percent of the work force is engaged in primary production. Each day, the people of Hong Kong consume about 1,000 metric tons of rice, 1,300 metric tons of vegetables, 10,300 pigs, 500 head of cattle, 330 metric tons of poultry, 430 metric tons of fish, and 1,200 metric tons of fruit. Although local farmers satisfy some of the demand, most of Hong Kong's food supply is imported.

In terms of quantity, local producers furnish about 34 percent of Hong Kong's fresh vegetables, 39 percent of its live poultry, 17 percent of its pigs, and 12 percent of its freshwater fish. The fishing fleet, numbering about 4,700 vessels, supplies about 86 percent of Hong Kong's fresh saltwater fish. Foodstuffs account for about 12 percent of Hong Kong's imports from China.

Based on the above figures, Hong Kong residents, according to the United Nations Food and Agriculture Organization, are among the world's highest consumers of protein.

Within secondary production (i.e., manufacturing; the provision of electricity, gas, and water; and construction), manufacturing accounts for the largest share of the GDP and employment. Table 5 details establishments and employment in manufacturing. The contribution of the manufacturing sector to the GDP declined steadily from 31 percent in 1970 to 21 percent in 1982, but recovered to 24 percent in 1984. However, this relative contribution dropped to about 22 percent in both 1985 and 1986. Manufacturing industries accounted for about 35 percent of total employment. The construction sector's share of the GDP has increased from 4 percent in 1970 to 8 percent in 1981, before settling at about 5 percent during the 1984–1986 period.

Among the factors that contribute to Hong Kong's success as a leading manufacturing and commercial center include a simple tax structure, a flexible and hardworking labor force, a modern and efficient seaport with one of the world's leading container ports, a centrally located airport with a computerized cargo terminal, excellent worldwide communications, and the government's commitment to free trade and enterprise.

It is estimated that up to 90 percent of Hong Kong's manufacturing output is eventually exported. (The value of domestic products exported during 1987 amounted to HK$195.3 million, 27 percent more than in 1986.) The shortage of usable land has generally constrained diversification into capital and land-intensive industries. Light manufacturing industries, producing mainly consumer goods and operating in multistory factory buildings, predominate. About 70 percent of the total industrial work force is employed in the following industries: textiles, clothing, electronics, plastic products, electrical appliances, and watches and clocks. These industries together accounted for 80 percent of Hong Kong's domestically manufactured products exported in 1987.

Table 5

Establishments and Employment in Manufacturing Industry
(By Main Industrial Groups)

Industry	Establishments 1985	Establishments 1986	Establishments 1987	Employees 1985	Employees 1986	Employees 1987
Food Products	970	964	953	17,168	18,040	18,246
Beverages	30	30	30	4,447	4,667	4,562
Tobacco	3	4	6	1,210	1,102	1,080
Textiles (Including Knitwear)	4,814	5,049	5,324	108,376	116,056	122,960
Wearing Apparel (except Footwear and Knitwear)	9,267	9,211	9,382	259,911	263,548	258,413
Leather and Leather Products (except Footwear and Knitwear)	236	233	238	3,148	3,211	2,962
Footwear (except Rubber, Plastic, and Wooden)	533	511	485	7,780	8,186	8,266
Wood and Cork Products (except Furniture)	1,010	961	900	4,992	4,765	4,504
Furniture and Fixtures (except Primarily of Metal)	1,286	1,311	1,279	8,218	7,905	7,864
Paper and Paper Products	1,432	1,516	1,612	13,466	14,464	14,938
Printing, Publishing, and Allied Industries	3,253	3,375	3,612	30,385	32,134	34,188
Chemicals and Chemical Products	838	835	861	8,731	8,639	8,717
Petroleum and Coal Products	5	4	4	221	192	190
Rubber Products	279	274	237	2,237	2,437	1,737
Plastic Products	5,301	5,460	5,717	84,686	89,447	85,836

(Continued)

Table 5 (Continued)

Establishments and Employment in Manufacturing Industry
(By Main Industrial Groups)

Industry	Establishments 1985	Establishments 1986	Establishments 1987	Employees 1985	Employees 1986	Employees 1987
Nonmetallic Mineral Products (except Petroleum and Coal Products)	365	365	383	4,107	4,462	4,925
Basic Metal Industries	277	268	267	3,798	3,318	3,455
Fabricated Metal Products (except Machinery and Equipment)	6,594	6,677	6,876	63,030	64,168	62,975
Machinery (except Electrical)	3,876	4,167	4,612	21,995	24,272	26,138
Electrical Machinery, Apparatus, Appliances, and Supplies	2,113	1,979	2,087	113,991	115,092	118,314
Transport Equipment	602	574	567	13,143	12,664	13,196
Professional and Scientific, Measuring and Controlling Equipment, and Photographic and Optical Goods	1,630	1,472	1,516	42,730	39,404	38,454
Other Manufacturing Industries	3,331	3,383	3,461	31,130	31,580	33,330
Total	48,065	48,623	50,409	848,900	869,753	875,250

Source: Hong Kong Government

The combined contribution of tertiary services sectors (comprising the wholesale and retail and import/export trades; restaurants and hotels; transportation, storage and communications sectors; finance, insurance, real estate, and business services; and community, social, and personal services) to the GDP increased from 61 percent in 1970 to 65 percent in 1982. This share of the GDP remained stable at about 62 to 64 percent during the 1983-1986 period.

The tertiary services sectors are highly diversified. The contribution of the wholesale, retail and import/export trades, and restaurants and hotels to the GDP varied between 19 and 23 percent during the past 15 years. The contribution to GDP by the transportation, storage, and communications sector was stable at about 7 to 8 percent. The contribution to the GDP by the finance, insurance, real estate, and business services sector, however, experienced considerable fluctuations. It rose gradually from 15 percent in 1970 to 24 percent in 1981, but fell to 16 percent in 1984, mainly reflecting the slump in the property market. In 1986, its GDP contribution increased again to 17 percent.

Hong Kong's economy was buoyant throughout 1987, and this, coupled with a further decline in the unemployment rate, resulted in higher wages in the manufacturing and construction sectors.

After allowing for rises in consumer prices, workers' wages increased by 3.4 percent in real terms during the 12 months ending in September 1987. The overall average daily wage rate for workers was HK$124 for males and HK$109 for females.

Unemployment for the third quarter of 1987 fell to 1.8 percent, and under-employment to 1.0 percent. A shortage of workers became apparent in some sectors during the latter part of the year.

Hong Kong's labor force totals 2.7 million people, 63 percent of which are males and 37 percent females.

The work force is engaged primarily in:

- Manufacturing, 34.8 percent
- Wholesale and retail trade, restaurants and hotels, 23.2 percent
- Community, social, and personal services, 17.0 percent
- Transport, storage, and communications, 8.5 percent
- Construction, 8.1 percent
- Finance, insurance, real estate, and business services, 6.3 percent

According to a survey of employment, vacancies, and payroll in the manufacturing sector conducted in September 1987, 875,250 people were employed at 50,409 establishments. The survey covered working proprietors and partners, employees receiving pay, and unpaid family workers affiliated with business organizations. Some 381,373 people—the largest portion of the manufacturing work force—worked in the textile and apparel industries. The electrical and plastics industries were the next two largest employers.

The bulk of the manufacturing work force is concentrated in the urban areas of Hong Kong Island and Kowloon and satellite towns in the New Territories. Industrial development in the New Territories is increasing, and 35 percent of the manufacturing work force now works there.

In terms of employment, the most notable change in recent years was that, whereas employment in the manufacturing sector still accounted for both the largest share of the employed labor force and the largest share of the population census, this share declined from 47 percent in 1971 to 41 percent in 1981, and further to 36 percent in 1986. On the other hand, the share of the tertiary services sectors as a whole increased from 41 percent of total employment in 1971 to 47 percent in 1981, and further to 55 percent in 1986.

Due to limited natural resources, Hong Kong depends almost entirely on imports for its material input requirements, including food and other consumer goods, raw materials, capital goods, and fuel. It must necessarily export on a scale sufficient to generate foreign exchange earnings to pay for these imports. Furthermore, Hong Kong's volume of exports must continue to grow if the living standards are to rise.

Hong Kong's economic external orientation is illustrated by the fact that, in 1987, the total value of visible trade (i.e., exports of domestic goods, reexports, and imports) amounted to 210 percent of the GDP. If service exports and imports are also included, this ratio rises to 216 percent. Since 1987, Hong Kong's exports of domestic goods have grown at an average annual rate of about 11 percent in real terms, roughly twice the growth rate of world trade.

THE ECONOMY IN 1987

Hong Kong's economy remained buoyant in 1987, displaying a considerable degree of flexibility and resilience at a time when production was pushed to capacity. Continuing the trend established in 1986, exports of domestic goods and reexports grew rapidly, as did domestic demand, including both consumption demand and investment demand (see Tables 6 and 7). Against this background, the unemployment rate dropped to a historically low level and shortages of labor were experienced in many sectors, resulting in significant upward pressure on wages and salaries. The rate of inflation accelerated but was still moderate compared with Hong Kong's experience over the past decade. The demand for most types of property remained firm during 1987, and trading in the property market was active.

Preliminary estimates show that the growth rate of real GDP was 14 percent in 1987, following an increase of 11 percent in 1986. Thus the economy has enjoyed double-digit growth for two consecutive years. Economic growth in 1987 was mainly export-led, but the upsurge in domestic demand also contributed. However, largely because the economy adjusted itself to the rapid growth and possibly also because of the stock market crash in October, there were signs that the economy was settling to a more moderate growth rate toward the end of 1987.

Table 6

Expenditure on the GDP—1987 Market Prices (Millions of HK$)

GDP Components	1985	1986*	1987**
Private Consumption Expenditure	HK$169,855	HK$193,198	HK$224,047
Government Consumption Expenditure	19,916	22,969	25,721
Gross Domestic Fixed Capital Formation	55,115	66,767	86,700
Change in Stocks	1,469	3,177	4,428
Total Exports of Goods	235,152	276,530	378,034
Less Imports of Goods	232,617	277,500	379,989
Exports of Services	45,846	53,654	66,945
Less Imports of Services	33,541	38,969	45,649
Total Expenditure on GDP at Current Market Prices	HK$261,195	HK$299,826	HK$360,237
Per Capita GDP at Current Market Prices (HK$)	HK$ 47,871	HK$ 54,193	HK$ 64,174

*Provisional estimates
**Preliminary estimates

Table 7

Expenditure on the GDP—Constant (1980) Market Prices (Millions of HK$)

GDP Components	1985	1986*	1987**
Private Consumption Expenditure	HK$115,076	HK$126,164	HK$139,847
Government Consumption Expenditure	12,546	13,328	13,954
Gross Domestic Fixed Capital Formation	46,536	49,970	57,554
Change in Stocks	1,026	2,330	2,781
Total Exports of Goods	161,413	185,924	247,243
Less Imports of Goods	163,566	185,854	244,760
Exports of Services	32,408	37,056	43,529
Less Imports of Services	25,493	28,883	32,951
Total Expenditure on GDP at Constant (1980) Market Prices	HK$179,946	HK$200,035	HK$227,197
Per Capita GDP at Current Market Prices (HK$)	HK$ 32,980	HK$ 36,156	HK$ 40,474

*Provisional estimates
**Preliminary estimates

Source: Hong Kong Government

EXTERNAL TRADE

In 1987, nominal domestic exports grew by 27 percent, or 23 percent in real terms. This compared with an increase of 19 percent in nominal terms, or 16 percent in real terms, recorded in 1986. A major factor behind this strong performance was the sustained demand for imports in Hong Kong's major overseas markets. The depreciation of the Hong Kong dollar, in line with that of the U.S. dollar under the linked exchange rate system, against most major currencies also helped to improve the price competitiveness of Hong Kong's products. Real domestic exports to the United States, which was Hong Kong's largest market, grew by about 10 percent. Much faster growth was, however, recorded for domestic exports to other major markets such as Japan (at about 41 percent in real terms), West Germany (about 27 percent), and the United Kingdom (about 27 percent). The currencies of these countries were relatively strong against the Hong Kong dollar. Real exports of domestic goods to China, which was Hong Kong's second largest market, grew by about 52 percent. This substantial growth was, however, largely attributable to the increased outward processing trade with China. As a result of this growth pattern, the relative importance of the U.S. market in Hong Kong's overall exports of domestic goods dropped to 37 percent in 1987 from 42 percent in 1986 (see Table 8).

In terms of the major product categories, real exports of domestically manufactured clothing grew by about 17 percent and those of textiles by about 38 percent in 1987. (Table 9 details Hong Kong's external trade by major product type.) They accounted for 33 percent and 8 percent, respectively, of the total value of domestic exports. Substantial increases were also recorded for real exports of domestically manufactured radios (about 8 percent), domestic electrical appliances (about 13 percent), and metal products (about 27 percent.) Real exports of other domestically produced goods grew about 23 percent.

In 1987, nominal reexports grew by 49 percent, or in real terms by about 46 percent, representing a sharp increase from corresponding growth rates of 16 percent and 14 percent in 1986. (Hong Kong's reexports by major product type are detailed in Table 10.) This rapid growth was due mainly to the flourishing entrepot trade with China, which featured prominently both as a source and as a market for Hong Kong's reexports. Nearly 80 percent of Hong Kong's reexports during the year were associated with the Chinese trade. The other major reexport markets were the United States, Taiwan, the Republic of Korea, Japan, and Singapore. With respect to the origins of the reexports, the major suppliers apart from China were Japan, the United States, Taiwan, and the Republic of Korea. When analyzed by end-use categories, a major share of Hong Kong's reexports of textile yarn, fabrics and made-up articles, clothing, travel goods, and miscellaneous manufactured articles showed more rapid increases in real terms than other items.

Table 8

Hong Kong's External Trade by Major Trading Partners

	1985		1986	
	HK$ Millions	Percent	HK$ Millions	Percent
Imports				
China	HK$ 58,963	25.5%	HK$ 81,633	29.6%
Japan	53,350	23.1	56,398	20.4
Taiwan	20,898	9.0	23,977	8.7
United States	21,896	9.5	23,198	8.4
Republic of Korea	8,293	3.6	10,970	4.0
Singapore	11,281	4.9	10,882	3.9
United Kingdom	8,450	3.7	9,347	3.4
Federal Republic of Germany	6,672	2.9	8,041	2.9
Switzerland	3,637	1.6	5,543	2.0
Italy	3,582	1.5	4,413	1.6
Others	34,398	14.9	41,553	15.1
Total	HK$231,420	100.0%	HK$275,955	100.0%
Domestic Goods Exported				
United States	HK$ 57,687	44.4%	HK$ 64,219	41.7%
China	15,189	11.7	18,022	11.7
Federal Republic of Germany	7,998	6.2	11,003	7.1
United Kingdom	8,546	6.6	9,918	6.4
Japan	4,480	3.4	6,212	4.0
Canada	4,405	3.4	4,880	3.2
Netherlands	2,083	1.6	2,803	1.8
Singapore	2,233	1.7	2,794	1.8
France	1,818	1.4	2,640	1.7
Australia	3,349	2.6	3,376	2.2
Others	22,092	17.0	28,115	18.3
Total	HK$129,882	100.0%	HK$153,983	100.0%
Reexports				
China	HK$ 46,023	43.7%	HK$ 40,894	33.4%
United States	14,705	14.0	22,362	18.2
Japan	5,486	5.2	6,676	5.4
Taiwan	4,325	4.1	5,939	4.8
Republic of Korea	3,872	3.7	5,843	4.8
Singapore	4,388	4.2	5,259	4.3
Federal Republic of Germany	1,554	1.5	2,688	2.2
United Kingdom	1,233	1.2	2,489	2.0
Macao	2,556	2.4	2,584	2.1
Australia	1,354	1.3	1,830	1.5
Others	19,774	18.8	25,983	21.2
Total	HK$105,270	100.0%	HK$122,546	100.0%

Note: Columns may not add to totals shown because of rounding.

(Continued)

Table 8 (Continued)

Hong Kong's External Trade by Major Trading Partners

	1987		Change in Percent
	HK$ Millions	Percent	(1986-1987)
Imports			
China	HK$117,357	31.1%	43.8%
Japan	71,905	19.0	27.5%
Taiwan	33,337	8.8	39.0%
United States	32,242	8.5	39.0%
Republic of Korea	16,959	4.5	54.6%
Singapore	14,357	3.8	31.9%
United Kingdom	11,713	3.1	25.3%
Federal Republic of Germany	10,166	2.7	26.4%
Switzerland	7,375	2.0	33.1%
Italy	6,170	1.6	39.8%
Others	56,367	14.9	35.6%
Total	HK$377,948	100.0%	37.0%
Domestic Goods Exported			
United States	72,817	37.3%	13.4%
China	27,871	14.3	54.6%
Federal Republic of Germany	14,855	7.6	35.0%
United Kingdom	12,905	6.6	30.1%
Japan	9,489	4.9	52.8%
Canada	5,656	2.9	15.9%
Netherlands	4,027	2.1	43.7%
Singapore	3,880	2.0	38.8%
France	3,790	1.9	43.5%
Australia	3,697	1.9	9.5%
Others	36,267	18.6	29.0%
Total	HK$195,254	100.0%	26.8%
Reexports			
China	HK$ 60,170	32.9%	47.1%
United States	32,454	17.8	45.1%
Japan	9,772	5.3	46.4%
Taiwan	9,685	5.3	63.1%
Republic of Korea	8,969	4.9	53.5%
Singapore	6,481	3.5	23.2%
Federal Republic of Germany	5,533	3.0	105.8%
United Kingdom	4,271	2.3	71.6%
Macao	3,326	1.8	28.7%
Australia	2,913	1.6	59.2%
Others	39,207	21.5	50.9%
Total	HK$182,780	100.0%	49.2%

Note: Columns may not add to totals shown because of rounding.

Source: Hong Kong Government

Table 9

Exports of Domestic Goods by Major Industrial Classification
(Millions of HK$)

Section/Division	1985	1986	1987
Food and Live Animals Chiefly for Food			
Fish, Crustaceans and Mollusks, and Preparation	477	681	767
Cereals and Cereal Preparations	103	133	156
Miscellaneous Edible Products and Preparation	383	413	463
Others	382	393	344
Subtotal	1,346	1,620	1,730
Beverages and Tobacco			
Beverages	209	219	237
Tobacco Products	907	927	1,294
Subtotal	1,116	1,146	1,531
Crude Materials, Inedible, except Fuels			
Pulp and Waste Paper	182	259	403
Metalliferous Ores and Metal Scrap	1,070	745	1,203
Crude Animal and Vegetable Materials, NES	130	137	187
Others	111	93	120
Subtotal	1,493	1,235	1,912
Mineral Fuels, Lubricants, and Related Materials	443	463	502
Animal and Vegetable Oils, Fats, and Waxes	9	10	18
Chemicals and Related Products, NES			
Dyeing, Tanning, and Coloring Materials	117	161	224
Essential Oils and Perfume Materials; Toilet, Polishing and Cleansing Preparations	406	450	497
Artificial Resins and Plastic Materials, and Cellulose Esters and Ethers	510	597	1,344
Others	246	295	446
Subtotal	1,278	1,502	2,512

(Continued)

Table 9 (Continued)

Exports of Domestic Goods by Major Industrial Classification
(Millions of HK$)

Section/Division	1985	1986	1987
Manufactured Goods Classified Chiefly by Materials			
Paper, Paperboard, and Articles of Paper Pulp, of Paper or of Paperboard	673	934	1,349
Textile Yarn, Fabrics, Made-Up Articles, NES and Related Products	7,823	10,955	16,005
Nonmetallic Mineral Products, NES	663	849	1,055
Metal Products, NES	2,936	3,474	4,510
Others	817	830	1,238
Subtotal	12,911	17,042	24,157
Machinery and Transport Equipment			
Telecommunications and Sound Recording and Reproducing Apparatus and Equipment	8,993	11,681	14,873
Electrical Machinery, Apparatus and Appliances, NES, and Electrical Parts Thereof	10,037	11,214	14,501
Others	9,752	10,411	13,780
Subtotal	28,782	33,306	43,155
Miscellaneous Manufactured Articles			
Sanitary, Plumbing, Heating and Lighting Fixtures and Fittings, NES	1,006	1,147	1,473
Travel Goods, Handbags, and Similar Containers	1,602	1,602	1,658
Articles of Apparel and Clothing Accessories	44,912	52,162	65,321
Footwear	1,055	1,219	1,448
Professional, Scientific and Controlling Instruments and Apparatus, NES	431	609	1,012
Photographic Apparatus, Equipment and Supplies, and Optical Goods, NES; Watches and Clocks	10,735	13,041	15,646
Miscellaneous Manufactured Articles, NES	20,541	25,430	29,983
Others	580	573	668
Subtotal	80,862	95,783	117,208
Commodities and Transactions Not Classified According to Kind	1,642	1,876	2,529
Total Merchandise	129,882	153,983	195,254
Gold and Specie	-	-	-
Grand Total	129,882	153,983	195,254

NES = Not Elsewhere Specified

Source: Hong Kong Government

Table 10

Reexports by Major Industrial Classification
(Millions of HK$)

Section/Division	1985	1986	1987
Food and Live Animals Chiefly for Food			
Fish, Crustraceans and Mollusks, and Preparation	1,664	2,339	2,933
Vegetables and Fruit	1,290	1,967	2,197
Coffee, Tea, Cocoa, Spices, and Manufacture Thereof	836	927	708
Miscellaneous Edible Products and Preparations	313	351	557
Others	706	939	1,083
Subtotal	4,809	6,525	7,477
Beverages and Tobacco			
Beverages	398	397	550
Tobacco Products	1,099	1,194	1,586
Subtotal	1,497	1,591	2,135
Crude Materials, Inedible, except Fuels			
Hides, Skins and Furskins, Raw	186	297	548
Textile Fibers (Other than Wool Tops) and Their Wastes (Not Made into Yarn or Fabric)	2,233	2,283	3,674
Crude Animal and Vegetable Materials, NES	2,166	2,078	3,289
Others	1,042	1,148	1,473
Subtotal	5,627	5,807	8,984
Mineral Fuels, Lubricants, and Related Materials			
Petroleum, Petroleum Products, and Related Materials	657	1,121	1,183
Others	34	33	41
Subtotal	691	1,154	1,224
Animal and Vegetable Oils, Fats, and Waxes	123	266	241
Chemicals and Related Products, NES			
Organic Chemicals	964	1,529	2,246
Medicinal and Pharmaceutical Products	1,293	1,670	2,336
Artificial Resins and Plastic Materials, and Cellulose Esters and Ethers	1,344	1,767	3,746
Others	4,426	5,288	7,037
Subtotal	8,027	10,254	15,364

(Continued)

Table 10 (Continued)

Reexports by Major Industrial Classification
(Millions of HK$)

Section/Division	1985	1986	1987
Manufactured Goods Classified Chiefly by Materials			
Textile Yarn, Fabrics, Made-Up Articles, NES, and Related Products	15,999	20,094	28,332
Nonmetallic Mineral Products, NES	3,423	3,831	5,176
Nonferrous Metals	2,201	1,540	2,501
Metal Products, NES	1,829	2,385	3,010
Others	3,981	4,623	6,518
Subtotal	27,433	32,474	45,536
Machinery and Transport Equipment			
Machinery Specialized for Particular Industries	3,730	3,423	5,342
Telecommunications and Sound Recording and Reproducing Apparatus and Equipment	6,999	6,680	11,955
Electrical Machinery, Apparatus and Appliances, NES, and Electrical Parts Thereof	8,989	9,618	15,956
Others	11,581	8,362	12,297
Subtotal	31,299	28,083	45,551
Miscellaneous Manufactured Articles			
Travel Goods, Handbags, and Similar Containers	2,160	3,199	5,831
Apparel and Clothing Accessories	7,652	13,366	18,279
Photographic Apparatus, Equipment and Supplies and Optical Goods, NES; Watches and Clocks	5,528	5,735	8,163
Miscellaneous Manufactured Articles, NES	7,192	10,343	17,884
Others	2,708	3,183	5,272
Subtotal	25,239	35,825	55,429
Commodities and Transactions Not Classified According to Kind	525	568	838
Total Merchandise	105,270	122,546	182,780
Gold and Specie	522	5,857	2,337
Grand Total	105,793	128,404	185,118

NES = Not Elsewhere Specified

Source: Hong Kong Government

Nominal imports grew by 37 percent, or by about 32 percent in real terms, which compared favorably with the corresponding growth rates of 19 percent and 14 percent in 1986. (Table 11 details Hong Kong's imports by major product type.) The major sources of imports were China, Japan, Taiwan, the United States, the Republic of Korea, and Singapore. Apart from the upsurge in reexport trade, a significant proportion of this growth was attributable to real retained imports, which registered an increase of 21 percent. Retained imports of raw materials and semimanufacturers and of capital goods, in particular, grew by about 27 percent and 26 percent, respectively.

As the value of total exports (domestic exports plus reexports) was slightly higher than that of imports, a visible trade surplus of only HK$87 million was recorded in 1987. Thus, the visible trade account was virtually in balance. This compared with a surplus of HK$0.6 billion, equivalent to 0.2 percent of the total value of imports, recorded in 1986. As the price of imports rose slightly faster than those of total exports, the terms of trade deteriorated slightly over the 1986 level.

Table 11
Imports by Major Industrial Classification
(Millions of HK$)

Section/Division	1985	1986	1987
Food and Live Animals Chiefly for Food			
Live Animals Chiefly for Food	2,355	2,250	2,254
Meat and Meat Preparations	2,535	2,675	2,952
Fish, Crustraceans and Mollusks, and Preparation	3,629	4,797	6,121
Cereals and Cereal Preparations	2,066	2,023	1,995
Vegetables and Fruit	4,976	5,768	6,449
Others	4,403	4,968	5,759
Subtotal	19,965	22,481	25,530
Beverages and Tobacco			
Beverages	1,368	1,652	2,355
Tobacco Products	2,485	2,292	3,105
Subtotal	3,582	3,944	5,460
Crude Materials, Inedible, except Fuels			
Hides, Skins and Furskins, Raw	809	1,284	2,407
Textile Fibers (Other than Wool Tops) and Their Wastes (Not Made into Yarn or Fabric)	3,679	3,444	5,522
Crude Animal and Vegetable Materials, NES	2,563	3,045	4,343
Others*	1,940	2,091	3,534
Subtotal*	8,991	9,865	14,806
Mineral Fuels, Lubricants, and Related Materials			
Petroleum, Petroleum Products, and Related Materials	8,685	6,700	7,218
Others	2,141	2,160	2,254
Subtotal	10,826	8,860	9,472
Animal and Vegetable Oils, Fats, and Waxes			
Fixed Vegetable Oils and Fats	697	622	638
Others	34	62	34
Subtotal	731	684	672
Chemicals and Related Products, NES			
Organic Chemicals	1,936	2,745	4,045
Dyeing, Tanning, and Coloring Materials	1,941	3,016	3,659
Artificial Resins and Plastic Materials, and Cellulose Esters and Ethers	4,859	6,454	10,921
Others*	7,500	9,010	12,055
Subtotal*	16,236	21,226	30,679

(Continued)

Table 11 (Continued)

Imports by Major Industrial Classification
(Millions of HK$)

Section/Division	1985	1986	1987
Manufactured Goods Classified Chiefly by Materials			
Paper, Paperboard, and Articles of Paper Pulp, of Paper or of Paperboard	4,394	5,727	7,811
Textile Yarn, Fabrics, Made-Up Articles, NES, and Related Products	33,661	42,585	57,316
Nonmetallic Mineral Products, NES	8,429	11,451	15,193
Iron and Steel	6,072	6,865	7,939
Others	12,065	13,613	19,283
Subtotal	64,621	80,241	107,542
Machinery and Transport Equipment			
Office Machines and Automatic Data Processing Equipment	7,325	6,645	9,642
Telecommunications and Sound Recording and Reproducing Apparatus and Equipment	12,130	13,870	21,713
Electrical Machinery, Apparatus and Appliances, NES, and Electrical Parts Thereof	19,094	23,642	35,046
Others	20,879	22,090	31,784
Subtotal	59,427	66,247	98,184
Miscellaneous Manufactured Articles			
Travel Goods, Handbags, and Similar Containers	2,315	3,533	5,912
Apparel and Clothing Accessories	13,071	19,701	26,031
Photographic Apparatus, Equipment and Supplies and Optical Goods, NES; Watches and Clocks	13,255	16,360	20,783
Miscellaneous Manufactured Articles, NES	11,105	14,714	21,323
Others	5,653	6,569	9,492
Subtotal	45,400	60,876	83,541
Commodities and Transactions Not Classified According to Kind	1,370	1,533	2,061
Total Merchandise	231,420	275,955	377,948
Gold and Specie	13,437	4,993	18,648
Grand Total	244,857	280,948	396,596

NES = Not Elsewhere Specified

*As there was a reclassification of commodities in 1987, figures for 1985 and 1986 have been revised to the new classification to permit comparison.

Source: Hong Kong Government

Demography and Economy—Singapore

DEMOGRAPHY

Singapore's 1986 population was 2,586,200. Its 1978 to 1985 growth rate was 1.1 percent per year. Population density rose only 0.9 percent in 1986, from 4,122 persons per square kilometer in 1985 to 4,160 persons per square kilometer in 1986.

The ethnic composition of the population is summarized in Table 1.

Table 1

Ethnic Composition—Singapore

Ethnic Group	Population	Share of Population
Chinese	1,972,000	76.3%
Malaysian	387,400	15.0%
Indians	166,800	6.4%
Other	60,000	2.3%

Note: Indians includes the following groups: Bangladeshis, Pakistanis, and Sri Lankans.

Source: Information Division
Ministry of Communications
and Information

The overall male to female ratio of the population is approximately 1,038:1,000. The Chinese and Malaysians have relatively balanced male to female ratio—1,016:1,000 and 1,065:1,000, respectively. By contrast, the Indian male to female ratio is less balanced—1,254:1,000.

The crude birth rate has declined 3.5 percent annually, from about 42.7 births per 1,000 population in 1957 to 15.2 births per 1,000 population in 1986. Over the same time period, the total fertility rate has declined 4.9 percent a year, from 6,406 births per 1,000 women aged 15–44 years in 1957 to 1,483 per 1,000 women aged 15–44 years in 1986. The total fertility rate is the number of births that 1,000 women would have in their lifetime if, at each year of age, they experience the birth rates occurring in the specified year.

The crude death rate has declined 1.3 percent per annum, from 7.4 deaths per 1,000 people in 1957 to 5.0 deaths per 1,000 in 1986.

Demography and Economy—Singapore

Additional demographic statistics are shown in Table 2.

Table 2

Demographic Statistics—Singapore

Population	
1986 Size (Millions)	2.6
1978-85 CAGR	1.1%
2000 Projected Size (Millions)	2.9
Population Doubling Time (Years)	64
Urban Population as % of Total	100%
Birth Rate per 1,000	15.2
Death Rate per 1,000	5.0
Infant Mortality per 1,000	9.4
Population under 15 Years	23.9%
Population under 20 Years	36.0%
Population over 55 Years	10.7%
Population over 60 Years	7.9%
Life Expectancy: Males/Females	69/74
Health	
Hospital Beds per 1,000	3
Doctors per 1,000	1

Source: Information Division
Ministry of Communications and Information; Asia 1987 Yearbook, Far Eastern Economic Review

Singapore has a variety of English language schools that charge attendance fees of about S$5,000 to S$11,000 per year. There are also Dutch, French, German, Japanese, and Swiss schools. Children of expatriates who live in Singapore on employment passes or professional visit passes can apply for admission to government or government-aided schools through the Ministry of Education. At the post-secondary school level, the National University of Singapore provides a wide range of courses including electronics, engineering, medical studies, business administration, accounting, arts, and social services. Enrollments in Singapore's educational institutions are given in Table 3.

Table 3

Enrollment in Educational Institutions—Singapore

Year	Primary Schools	Secondary Schools	Technical & Vocational Institutes	Universities & Colleges	Total
1971	357,936	153,522	6,063	14,333	531,854
1972	354,748	161,371	5,841	15,206	537,166
1973	354,284	173,109	7,124	16,872	542,389
1974	337,816	174,177	6,250	17,802	536,045
1975	328,401	176,224	9,830	18,501	532,956
1976	316,265	177,992	11,751	20,594	526,602
1977	308,342	178,186	10,860	20,734	518,122
1978	300,398	179,811	9,830	20,377	510,416
1979	297,873	176,521	14,516	20,743	509,653
1980	299,252	173,693	12,542	22,551	507,998
1981	289,697	177,238	13,001	24,156	504,092
1982	289,092	176,845	14,990	26,736	507,663
1983	290,800	182,343	15,610	31,014	519,767
1984	288,623	187,764	14,396	35,783	526,566
1985	278,060	190,328	18,894	39,693	526,975
1986	268,820	203,088	20,873	42,007	534,788

Source: Information Division
Ministry of Communications
and Information

ECONOMICS

Overview

Singapore's economy has traditionally been based on foreign trade and commerce. In recent years, however, the government has actively encouraged the formation of domestic industry. Since Singapore has neither an abundance of natural resources nor a large domestic market, economic development has emphasized export-oriented industries. During the late 1970s and early 1980s, due to slower growth in the indigenous labor supply, increased protectionism in major export markets, and greater competition from other developing nations, government economic planners found it beneficial to shift industrial emphasis from labor-intensive production to high-technology, capital-intensive production. Wages were intentionally increased to encourage employers to follow this plan.

Demography and Economy--Singapore

Singapore is generally regarded as the financial, communications, and service center for the region. The country has a large number of banks, insurance companies, ship operators, traders, professional consulting firms, and offshore services companies as part of the business community.

Recent Economic Developments

During the 20 years from 1964 through 1984, Singapore's economy grew at an average annual rate of 9.0 percent per year. In 1985, the economy declined, registering a 1.8 percent drop in real gross domestic product (GDP). In 1986, however, the economy rebounded, albeit slowly, showing real growth of 1.9 percent in GDP to S$39.2 million. Statistics of Singapore's recent economic performance are shown in Table 4 and Figure 1.

Singapore's manufacturing sector recovered sharply in 1986. Industrial production was up a strong 8 percent, reversing the 1985 decline. Cost-cutting measures and an easing of the exchange rate helped improve the price competitiveness of local manufactured goods in the international markets. As a result, exports of manufactured goods increased substantially. The industries that performed well were electronic products, wearing apparel, fabricated metal products, electrical machinery, transportation equipment, and petroleum products.

The transportation and communications sector registered robust growth of 9 percent in 1986. A portion of the growth is attributed to the secondary effect of the growth in manufacturing exports. Part of the sector's growth is also the result of more competitive rates for air and sea transportation services and communication services. The Port of Singapore Authority reduced port fees, which increased the level of transshipment activities. The volume of seaborne cargo handled increased by 13 percent, while the volume of airborne cargo handled rose by 18 percent. Lower communications charges also resulted in a rise in international telephone and telex traffic.

The construction sector continued its decline, falling 25 percent in 1986. By year end, the value of total real construction had fallen to 64 percent of its 1984 peak. Excess vacant commercial and industrial floor space is forecast for the foreseeable future, assuring a continued decline in new contract awards.

The slump in the construction sector, weak domestic loan demand, and the recession in regional markets resulted in weak growth of 3 percent in the financial, insurance, and real estate sector. Most of the growth was due to rising activities in the Asian currency units of banks and merchant banks, trading in the foreign exchange market, the recovery of the stock market, and rising activities of insurance companies.

Singapore's overall balance of payments surplus declined to $1.2 billion in 1986 from $3.0 billion in 1985. The decline is due to a large outflow of funds through the banking system caused by excessive domestic liquidity. On current account, however, there was significant improvement. The overall surplus brought total foreign reserves to $28.2 billion by the end of 1986, sufficient to finance about eight months of retained imports.

Table 4

Economic Performance—Singapore

	1980	1981	1982
GNP at Current Market Prices (S$M)	24,188.5	28,191.2	31,775.7
GDP at 1968 Factor Cost (S$M)	12,160.5	13,369.3	14,217.9
Per Capita Indigenous GDP at Current Market Prices (S$)	7,693	9,126	10,262
Total External Trade (S$M)	92,797.1	102,538.8	104,717.4
Imports (S$M)	51,344.8	58,248.0	60,244.6
Exports (S$M)	41,452.3	44,290.8	44,472.6
Manufacturing Output* (S$M)	32,710.4	37,559.7	36,961.6
Census Value Added in Manufacturing* (S$M)	8,573.4	9,757.5	9,383.4
Net Foreign Investment Commitments in Manufacturing Sector** (S$M)	1,199.0	1,234.6	1,163.0
Commercial Banks (No.)	97	108	118
Assets/Liabilities of Commercial Banks (S$B)	33.3	44.6	48.5
POSB--Amount Due to Depositors at End of Period (S$M)	2,756.7	3,265.9	5,058.4
Official Foreign Reserves at End of Period (S$B)	13.8	15.5	17.9
Balance of Payments (Overall Balance) (S$M)	1,433.8	1,938.4	2,517.5
Currency in Gross Circulation at End Period (S$M)	3,499	3,690	4,339
Tourist Arrivals# (K Persons)	2,562.1	2,828.9	2,956.7
Tourist Earnings (S$M)	3,068.4	3,786.4	4,034.2
Available Hotel Rooms (No.)	12,479	13,267	13,784

	1983	1984	1985
GNP at Current Market Prices (S$M)	36,561.1	40,815.1	39,921.0
GDP at 1968 Factor Cost (S$M)	15,338.4	16,603.8	16,309.9
Per Capita Indigenous GDP at Current Market Prices (S$)	11,691	12,596	11,887
Total External Trade (S$M)	105,654.1	112,473.3	107,996.3
Imports (S$M)	59,504.2	61,133.6	57,817.5
Exports (S$M)	46,154.9	51,340.0	50,178.8
Manufacturing Output* (S$M)	37,650.2	41,480.2	38,665.5
Census Value Added in Manufacturing* (S$M)	9,855.6	11,122.4	10,694.6
Net Foreign Investment Commitments in Manufacturing Sector** (S$M)	1,269.8	1,336.7	903.7
Commercial Banks (No.)	122	129	135

(Continued)

Table 4 (Continued)

Economic Performance—Singapore

	1983	1984	1985
Assets/Liabilities of Commercial Banks (S$B)	56.5	65.7	70.6
POSB--Amount Due to Depositors at End of Period (S$M)	6,240.9	7,287.3	9,129.4
Official Foreign Reserves at End Period (S$B)	19.8	22.7	27.1
Balance of Payments (Overall Balance) (S$M)	2,237.7	3,230.6	2,970.9
Currency in Gross Circulation at End Period (S$M)	4,740	5,033	5,149
Tourist Arrivals# (K Persons)	2,853.6	2,991.4	3,031.0
Tourist Earnings (S$M)	4,214.8	3,965.0	3,653.0
Available Hotel Rooms (No.)	13,549	14,350	16,172

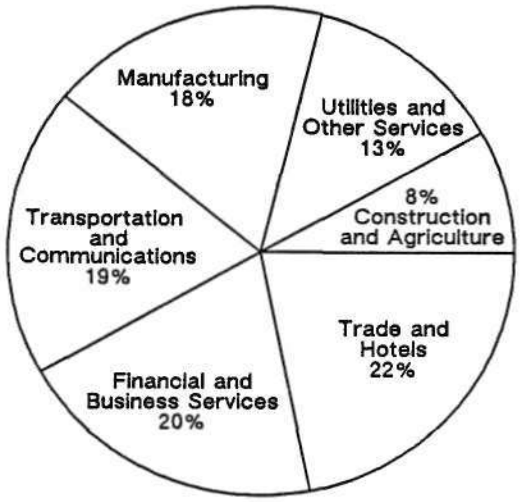
	1986
GNP at Current Market Prices (S$M)	39,185.2
GDP at 1968 Factor Cost (S$M)	16,611.7
Per Capita Indigenous GDP at Current Market Prices (S$)	11,588
Total External Trade (S$M)	104,530.9
Imports (S$M)	55,545.5
Exports (S$M)	48,985.4
Manufacturing Output* (S$M)	36,487.1
Census Value Added in Manufacturing* (S$M)	11,202.6
Net Foreign Investment Commitments in Manufacturing Sector** (S$M)	1,185.7
Commercial Banks (No.)	134
Assets/Liabilities of Commercial Banks (S$B)	76.8
PSOB--Amount Due to Depositors at End of Period (S$M)	10,166.1
Official Foreign Reserves at End of Period (S$B)	28.2
Balance of Payments (Overall Balance) (S$M)	1,199.3
Currency in Gross Circulation at End of Period (S$M)	5,484
Tourist Arrivals# (K Persons)	3,191.1
Tourist Earnings (S$M)	4,010.0
Available Hotel Rooms (No.)	18,858

*Includes rubber processing
**Excludes petrochemicals (refer to gross commitments less projects withdrawn or uncertain as of December 31, 1986)
#By air, sea, and land

Source: Information Division
Ministry of Communications and Information

Figure 1

Gross Domestic Product—Singapore



Source: Economic Development Board

Trade

In 1986, Singapore's total trade declined 3 percent from 1985. (In real terms, total trade rose 10 percent in 1986.) This compares with a 4 percent decline in 1985. The 1986 decline was largely caused by the global drop in oil prices. This led to a shrinking value of oil exports even though the export volume had increased. Excluding oil, which accounts for about 25.0 percent of total merchandise exported, grew 8.5 percent to $36.7 billion in 1986, compared with a 4.2 percent drop in 1985. Improved trade performance in the nonoil sector resulted from higher overseas demand for Singapore products. Cost-cutting measures and appreciation of the Japanese yen and European currencies against the Singapore dollar also helped improve Singapore's competitiveness.

Domestic exports declined 2.0 percent to $32 billion in 1986. This compares with a 1.0 percent decline in domestic exports in 1985. The 1986 decline was largely due to poor performance in domestic exports of oil products, which dropped 24.4 percent. The decrease in oil exports was caused mainly by the significant fall in oil prices rather than the demand for oil products. Growth in domestic exports of nonoil products was mainly driven by sales of office and data processing equipment, electronic components, televisions, animal and vegetable oils, and clothing.

Reexports declined 2 percent to $16.9 billion in 1986. This compares with a 3 percent fall in 1985. The decrease in entrepot trade was chiefly due to the slower growth in neighboring countries' economies and the impact of their direct trade policies. As a result, reexports to the United States, Singapore's second largest reexport market, sustained a 20 percent decline.

Singapore's total imports fell by 4 percent to $56 billion in 1986. This compares with a 5 percent drop in imports in 1985. The import declines that were registered in crude petroleum, animal and vegetable oils, palm oil and fatty acids, industrial machines, and transportation equipment were primarily due to the slowdown in entrepot trade.

The 4 percent decline in imports combined with the 2 percent decline in exports caused the trade deficit to shrink from $7.6 billion in 1985 to $6.6 billion in 1986. Imports and exports by commodity are depicted in Figure 2.

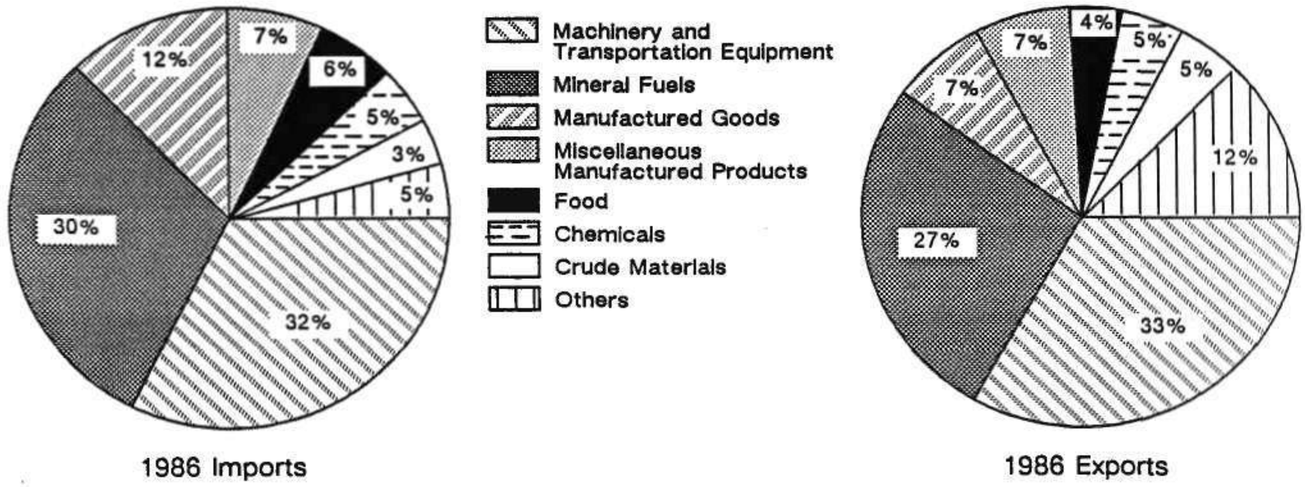
The European Economic Community (EEC), Japan, Malaysia, and United States maintained their positions as Singapore's four leading trading partners in 1986. Singapore's total exports to the European Economic Community and the United States rose in 1986, but exports to Malaysia and Japan declined, primarily from the fall in oil prices.

Thailand, which was Singapore's seventh largest trading partner in 1985, moved up to fifth position in 1986, replacing Hong Kong, which moved down to eighth position. The Federal Republic of Germany also gained in trading importance, moving from eleventh to sixth position.

Singapore's trade with the European Economic Community, Latin America, and Northeast Asia all underwent positive growth in 1986. Trade with the Eastern Block and the Oceania countries, on the other hand, decreased. Trade with South Korea and Taiwan grew by 28.5 percent and 20.3 percent, respectively. The relative shares of Singapore's import and exports, by country, are depicted in Figure 3.

Figure 2

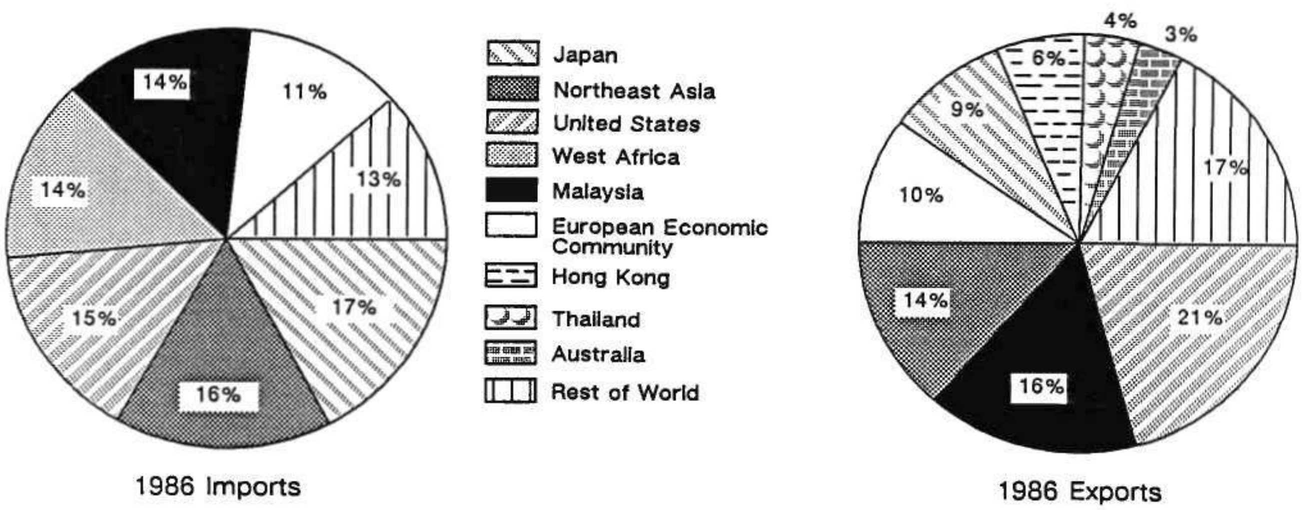
Imports and Exports by Commodity—Singapore



Source: Economic Development Board

Figure 3

Imports and Exports by Region/Country—Singapore



Source: Economic Development Board

Manufacturing Industries

In 1986, the manufacturing sector recovered, registering an 8 percent growth. Output grew in most of the major industries, but declined in the timber and machinery industries.

Electronics Industry

The electronics industry led the recovery in manufacturing, growing at 28 percent in 1986. Growth was largely fueled by the increase in global demand for data processing and data processing-related equipment. Growth was also caused by Japanese multinational electronics companies shifting production of consumer electronics to Singapore in response to its improved competitiveness, and to combat the yen's appreciation. Several consumer electronics companies expanded production into higher value-added products, such as compact disk players and health care electronics products.

Garment Industry

Output in the garment industry increased 15 percent in 1986. Appreciation of major EEC currencies and the strong U.S. market led to a surge of garment exports. Aggressive promotion through fashion exhibitions and cooperation with established designers enabled Singapore-designed clothing apparel to achieve high visibility in important overseas markets.

Fabricated Metal Products Industry

The fabricated metal products industry output grew 10 percent in 1986, following a 6 percent decline in 1985, which was caused by a slowdown in the construction sector. Growth was boosted by the increased demand for metal products and components in the electronics sector.

Transportation Equipment Industry

The transportation equipment industry, comprising land-, air-, and sea-related sectors, turned around in 1986, registering a 9 percent increase. The upturn was driven by two factors: the rise in oil tanker activity, resulting in higher demand for maintenance work; and the strong Japanese yen, which contributed to more Japanese ships docking for repairs in Singapore. In the aircraft-related sector, more companies expanded from engine service and overhaul into manufacturing-oriented activities.

Electrical Industry

Electrical industry output grew 9 percent. Growth was driven by increased orders of electrical parts and components such as precision motors and compressors.

Petroleum Industry

The petroleum industry grew 8 percent in 1986. The industry was able to secure more spot processing contracts as a result of the more competitive processing charges of local refineries and the increased flexibility in refining a variety of crudes.

Printing and Publishing Industry

The printing and publishing industry grew 4 percent in 1986. Growth was primarily due to increased overseas demand for printed material. Accessibility to sophisticated satellite telecommunication networks and high-quality printing facilities strengthened Singapore's position as an important regional publishing and distribution center, particularly for time-sensitive international newspapers and magazines.

Chemical Industry

Chemical products industry output growth slowed to 5 percent in 1986. The slowdown was caused by reduced demand from the construction, oilfield, and marine industries. The outlook for the regional export market for pharmaceuticals and health care products remained positive.

Machinery Industry

Machinery industry output declined 14 percent in 1986 due to sluggish worldwide demand for machine tools, industrial machinery, and oil rigs.

Timber Industry

The output of the timber industry was down 25 percent in 1986 as a result of sharper competition from countries with greater timber resources.

Services

In 1986, Singapore's services sector accounted for 52 percent of GDP, 44 percent of employment, and 45 percent of the country's net foreign exchange earnings.

Manufacturing statistics by major industry group for 1986 are given in Table 5.

Table 5

Manufacturing by Major Industry Group, 1986 Estimate—Singapore

Industry	Establishment No.	Establishment %	Employment No.	Employment %	Remuneration S$M	Remuneration %
Food and Beverages	304	8.7	12,809	5.2	203.1	5.7
Textiles	60	1.7	2,528	1.1	30.0	0.8
Wearing Apparel	446	12.8	26,020	10.8	222.2	6.2
Wood Products	108	3.1	3,057	1.3	34.6	1.0
Furniture	147	4.2	7,450	3.1	71.5	2.0
Paper Products and Printing	391	11.2	15,856	6.6	242.1	6.8
Chemical Products	144	4.1	7,535	3.1	179.6	5.1
Petroleum	13	0.4	3,411	1.4	137.4	3.9
Rubber and Plastic Products	250	7.2	8,600	3.6	102.4	2.9
Nonmetallic Minerals	103	2.9	5,503	2.3	87.8	2.5
Basic Metals	32	0.9	1,944	0.8	42.8	1.2
Fabricated Metal Products	433	12.4	18,284	7.6	270.3	7.6
Machinery and Appliances	670	19.2	100,671	41.8	1,468.7	41.4
Transport Equipment	214	6.1	17,216	7.1	335.6	9.4
Precision Equipment	40	1.1	5,077	2.1	62.9	1.8
Other Products	140	4.0	5,153	2.1	59.8	1.7
Total Excluding Rubber Processing	3,495	100.0	240,913	100.0	3,550.7	100.0
Rubber Processing	6	-	450	-	6.9	-
Total Including Rubber Processing	3,501	100.0	241,364	100.0	3,557.6	100.0

(Continued)

Table 5 (Continued)

Manufacturing by Major Industry Group, 1986 Estimate—Singapore

Industry	Output S$M	Output %	Census Value Added S$M	Census Value Added %	Workers per Establishment* No.
Food and Beverages	2,724.8	7.5	578.2	6.1	41
Textiles	215.3	0.6	66.0	0.6	42
Wearing Apparel	1,231.1	3.4	401.6	3.6	58
Wood Products	270.2	0.7	70.2	0.6	28
Furniture	377.6	1.0	137.8	1.2	51
Paper Products and Printing	1,438.0	4.0	744.6	6.7	41
Chemical Products	2,649.4	7.3	900.5	8.0	52
Petroleum	6,211.8	17.1	515.2	4.6	262
Rubber and Plastic Products	709.9	1.9	232.3	2.1	34
Nonmetallic Minerals	829.0	2.3	285.1	2.5	53
Basic Metals	540.7	1.5	134.1	1.2	61
Fabricated Metal Products	1,950.1	5.4	718.4	6.4	42
Machinery and Appliances	14,259.6	39.3	4,856.3	43.4	150
Transport Equipment	1,983.6	5.4	1,094.1	9.8	80
Precision Equipment	384.2	1.1	200.5	1.8	127
Other Products	550.3	1.5	160.6	1.4	37
Total Excluding Rubber Processing	36,325.5	100.0	11,195.3	100.0	69
Rubber Processing	161.5	-	7.4	-	75
Total Including Rubber Processing	36,487.1	100.0	11,202.6	100.0	69

*Refers to establishments engaging 10 or more persons.

(Continued)

Table 5 (Continued)

Manufacturing by Major Industry Group, 1986 Estimate—Singapore

Industry	Remuneration per Worker S$K	Census Value Added per Worker S$K	Ratio of Census Value Added to Output %
Food and Beverages	16.1	53.8	24.9
Textiles	11.9	26.1	30.7
Wearing Apparel	8.5	15.4	32.6
Wood Products	11.3	23.0	26.0
Furniture	9.6	18.5	36.5
Paper Products and Printing	15.3	47.0	51.8
Chemical Products	23.8	119.5	34.0
Petroleum	40.3	151.0	8.3
Rubber and Plastic Products	11.9	27.0	32.7
Nonmetallic Minerals	16.0	51.8	34.4
Basic Metals	22.0	69.0	24.8
Fabricated Metal Products	14.8	39.3	36.8
Machinery and Appliances	14.6	48.2	34.1
Transport Equipment	19.5	63.6	55.2
Precision Equipment	12.4	39.5	52.2
Other Products	11.6	31.2	29.2
Total Excluding Rubber Processing	14.7	46.5	30.8
Rubber Processing	15.3	16.4	4.6
Total Including Rubber Processing	14.7	46.4	30.7

Source: Department of Statistics

Demography and Economy--Singapore

Employment

Singapore's labor force numbered 1,228,600 persons aged 15 years and over in 1986. At midyear, the participation rate was 62.3 percent, and the unemployment rate was 6.5 percent. Labor force statistics are given in Table 6.

Table 6

Estimates of Labor Force,
Persons Aged 15 Years and Over, June 1986—Singapore

Population Aged 25 and Over (Thousand)	Total Labor Force (Thousand)	Employed Persons (Thousand)	Unemployed Persons (Thousand)	Labor Force Participation Rate (Percent)	Unemployment Rate (Percent)
1,972.5	1,228.6	1,149.0	79.5	62.3	6.5

Source: Information Division
Ministry of Communication
and Information

In 1986, there were 1,149,000 persons aged 15 years and over working in Singapore, comprising 969,300 employees, 58,900 employers, 99,300 self-employed workers, and 21,500 unpaid family workers. Of these, 81 percent of workers were employed either in manufacturing (25.2 percent), commerce (23.1 percent), community, social and personal services (22.6 percent), or transportation, storage, and communications (9.9 percent). Employed persons by occupation and by income distribution are given in Tables 7 and 8, respectively.

Table 7

Employed Persons by Occupation, June 1986 — Singapore

Occupation*	Employed Persons (Thousands)	%
Professional and Technical	126.5	11.0
Administrative, Managerial and executive	68.1	5.9
Clerical and Related	180.6	15.7
Sales	155.6	13.5
Services	136.5	11.9
Agricultural and Fishery	12.8	1.1
Production and Related	411.0	35.8
Not Classifiable	57.9	5.0
Total	1,149.0	100.0

*The occupation classifications for 1986 are based on the Singapore Standard Occupation Classification, 1978.

Table 8

Employed Persons by Income Distribution, June 1986 — Singapore

Gross Monthly Income S$	Employed Persons* (Thousands)	%
Under 200	50.2	4.4
200--399	154.0	13.7
400--599	292.1	25.9
600--799	201.2	17.8
800--999	119.2	10.6
1,000--1,499	149.0	13.2
1,500 and Over	161.8	14.4
Total	1,127.5	100.0

*Excluding unpaid family workers

Source: Information Division
Ministry of Communication
and Information

Demography and Economy--Singapore

Singapore's Employment Act contains its labor laws. The most pertinent provisions of the Employment Act, which apply only to persons earning less than S$1,250 (equal to US$579 at S$2.16/US$) per month are:

- Standard working week of 44 hours
- Overtime at 1.5 times the hourly rate; double time for work on regularly scheduled weekly days of rest
- Overtime limited to 72 hours per month
- Paid sick leave of 14 days after one year's service; 60 days in cases requiring hospitalization
- 11 paid public holidays
- 7 days annual leave after one year's service with the same employer; 14 days after 8 or more years of service with same employer;
- Retirement benefits may be paid after 5 years of service.

Wages in Singapore are generally lower than in Hong Kong and Japan but on the average are higher than in other Southeastern Asian countries, where industrialized skills are currently relatively more scarce. A wage freeze was implemented in 1986 to rectify this situation.

Employers have two options for compensating their employees in addition to basic wages:

- An annual wage supplement plus a negotiable annual bonus
- An annual wage supplement plus a negotiable annual wage increase

The bonus is negotiable for up to a maximum of three months without approval of the minister of Labor.

Any employee whose services have been terminated due to realignment of duties or reorganization of the employer's business is entitled to retrenchment benefits only if he or she has completed three years of service. Retrenchment benefits are negotiable. If an employee feels that he or she has been dismissed without just cause, the employee may refer the case to the minister of Labor, who may order reinstatement or direct the employer to pay compensation.

The Workman's Compensation Act of 1975 provides for the payment of compensation to employees who are injured or afflicted with occupational diseases in the course of work. Employers must carry insurance to cover such risks.

The average monthly basic wages for certain occupations (compiled from a September 1984 survey) are given in Table 9. Of course, actual wages paid to each employee vary with respect to skill, experience, length of service, and other factors. Salaries of professional and managerial staff are significantly higher.

Table 9

Average Monthly Basic Wages—Singapore

Occupation	Average Monthly Basic Wage US$
Architect, Engineer, and Supervisor	1,218
Production Supervisor and General Foreman	567
Salesman, Shop Assistant, and Demonstrator	234
Typist	318
Stenographic Secretary	586
Stenographic Typist (General)	434
Office Clerk	339

Source: Coopers & Lybrand

Government and Politics--South Korea

GOVERNMENTAL STRUCTURE

The Republic of Korea (South Korea) is a constitutional democracy. Its president, as chief executive of the administration, is the Republic's official representative. South Korea's legislátive arm is the unicameral National Assembly, whose members are elected by popular and secret vote under the party system.

The independent judiciary system functions on three levels: the Supreme Court, appellate courts, and district courts. The Supreme Court is empowered to rule on the constitutionality of laws and administrative decrees. It also hears all final appeals from the courts and courts-martial.

Administratively, the country is divided into nine provinces and four cities, Seoul, Pusan, Taegu, and Inchon, which have provincial status. The president appoints the heads of all local governments either directly or indirectly.

The Executive Branch

Presidential Office: The Blue House
1 Sejong-ro, Chongro-gu, Seoul

Office of the Prime Minister: 77 Sejong-ro, Chongro-gu, Seoul
18 ministries and 2 boards

The Legislative Branch

National Assembly: 1 Youido-dong, Yongdungpo-gu, Seoul
15 standing committees
National Assembly Secretariat
National Assembly Library

The Judicial Branch

Supreme Court: 37 Sosomun-dong, Chung-gu, Seoul
3 appellate courts
13 district courts
1 family court

Government and Politics--South Korea

Ministries

The executive branch of the government consists of presidential agencies and the cabinet. The cabinet has within its jurisdiction the State Council, the Economic Planning Board, the National Unification Board, and 18 ministries. The ministries are listed below:

- Agriculture and Fisheries
- Communications
- Construction
- Culture and Information
- Education
- Energy and Resources
- Finance
- Foreign Affairs
- Government Administration
- Health and Social Affairs
- Home Affairs
- Justice
- Labor
- National Defense
- Science and Technology
- Sports
- Trade and Industry
- Transportation

The Economic Planning Board and the ministries of primary interest to foreign investors are described in the following paragraphs.

Economic Planning Board (EPB)

The EPB takes charge of matters related to overall planning for development of the national economy, formulation and execution of the government budget, overall coordination of plans for mobilization of resources, investment, technical development, and economic cooperation with foreign countries and international organizations. The minister of economic planning also acts as a deputy prime minister, and coordinates business related to economy and finance among the ministries. The EPB has Offices of Budget, Planning and Management, and Fair Trade, and Bureaus of Economic Planning, Statistics, Industrial Policy Coordination, Price Policy, and Performance Evaluation. The EPB also has under its control and supervision the Fair Trade Commission, the Office of Supply, and the International Economic Policy Council.

Ministry of Foreign Affairs (MFA)

The MFA has jurisdiction over matters concerning diplomacy, trade, and treaties with foreign countries, other international agreements, protection and guidance of South Korean nationals abroad, and international organizations. Under the MFA's control are the Offices of Planning and Management, and Bureaus of Asian Affairs, European Affairs, African Affairs, Middle Eastern Affairs, American Affairs, Economic Affairs, Consular and Overseas Residents Affairs, Information and

Cultural Affairs, and International Organizations and Treaties. It maintains the Foreign Affairs and National Security Institute, which trains diplomatic service officials. The MFA coordinates foreign investment activities.

Ministry of Trade and Industry (MTI)

The MTI handles matters related to commerce, foreign trade, industry, patents, and standards of mineral and manufactured products. This ministry oversees the Office of Planning and Management, and the Bureaus of Trade and Commerce, International Trade Promotion, Basic Industry, Machinery Industry, Textile and Consumer Goods Industries, Electronics and International Appliance Industries, and Small and Medium Industries. The ministry also controls such diverse agencies as Patents Administration, the Industrial Advancement Administration, and the Free Export Zone Management Office.

Ministry of Energy and Resources (MER)

The MER is in charge of development, production, import, and all other matters related to energy and other resources. It comprises the Offices of Planning and Management and of Resources Policy, as well as the Bureaus of Electric Power, Mines, and Resources Development. It controls the Mines Registration Office and the Mines Safety Office.

Ministry of Communications (MOC)

The MOC controls postal affairs, telecommunications, postal exchange, postal savings, postal pensions, and national life insurance policies. It comprises the Office of Planning and Management, and the Bureaus of Postal Service, Telecommunications Administration, Radio Regulation, and Postal Savings, Insurance, and Finance. The MOC has under its control the Local Communications Office, the Postal Service Research Institute, the Postal Giro and Money Order Center, the Electronics and Telecommunications Research Institute, the Central Radio Monitoring Office, and the Communications Officials Training Institute.

Ministry of Science and Technology (MST)

The MST handles matters related to the development and application of science and technology, and the management of industrial and technical manpower. It comprises the Offices of Planning and Management and of R&D Policy and Coordination, and the Bureaus of Technology Promotion, Technical Cooperation, Atomic Energy, Information Industry, and Industrial Technology. The Central Meteorological Service, National Astronomical Research Center, National Science Museum, and Dae Duck Science Administration Office are also under its control.

Financial Structure

South Korea's financial sector includes a diversified commercial banking system, a wide range of secondary financial institutions, and a securities market. The development of the financial sector, particularly the banks, has not kept pace with the rest of the economy because it has been closely controlled. The government plans to turn over its share of national commercial banks to private interests while relying on the market mechanism and indirect means of control, such as reserve requirements, to regulate the industry. The securities market, which formerly permitted indirect foreign investment through unit trusts, has been further opened to foreign investors.

South Korea's financial institutions can be divided into two main categories: monetary institutions and other financial institutions. Examples of monetary institutions are the Bank of Korea and the deposit money banks. Deposit money banks can be either commercial banks or special banks, according to their government-determined economic goals.

Taxation

Tax Legislation

Under the South Korean constitution, tax legislation is enacted by the National Assembly. Proposed tax legislation is drafted by members of the National Assembly or by related ministries (e.g., national taxes by the Ministry of Finance and local taxes by the Ministry of Home Affairs) and submitted to the National Assembly through a resolution by the State Council. After passage by the National Assembly, new tax laws are transmitted to the administration for promulgation by the president. The law takes effect 20 days after promulgation, unless otherwise stipulated.

Generally, changes in South Korean tax laws become effective on the first day of January following the year in which they were passed.

Tax System

The South Korean tax system comprises both national and local taxes. National taxes consist of internal taxes, customs duties, and temporary defense and education taxes. The two temporary tax assessments, whose revenues were used for a specific purpose, expired at the end of 1985 and 1986, respectively. Internal taxes presently in force consist of five direct and six indirect taxes. Dividends received are taxable; those paid to nonresident foreign shareholders are subject to withholding taxes at the source.

Government and Politics--Taiwan

GOVERNMENTAL STRUCTURE

According to Dr. Sun Yat-sen, founder of the Republic of China, there are two kinds of political power--the people's and the government's. The people have authority over the government, while the government administers this power. The people have four political powers: suffrage, recall, initiative, and referendum. The government's administrative power is embodied in the five branches of Chinese government: the executive, legislative, judicial, examination, and control branches.

Dr. Sun believed the separation of government into three administrative branches to be inadequate. Should the executive and examination powers combine, a spoils system could result. Should the legislative organ ally with the control branch, the legislature could usurp the latter's power. Thus the examination and control functions were seen as necessarily autonomous from the other branches of government, leading to the five-branch system now in practice in Taiwan.

Division of authority between the central and local governments was also advocated by Dr. Sun. The line of demarcation is carefully drawn. Any matter falls within the jurisdiction of the Central Government if it is national in nature, of the province if it is provincial in nature, and of the county if it pertains to the county.

The Presidency

Taiwan's president is chief of state and its foremost political official. The Presidential Office consists of three bureaus, senior advisers, national policy advisers, strategy advisers, and the National Security Council (NSC). The NSC was established in 1967 to grant the President the right to exercise emergency powers.

The Legislative Branch

Under Taiwan's modified parliamentary system, the government's legislative branch comprises the National Assembly, the Legislative Yuan, and the Control Yuan.

In 1947 and 1948, representatives from all parts of China were elected to these bodies. Since elections can no longer be held in the mainland constituencies, these representatives have indefinite (i.e., lifetime) terms. Although many have passed away since 1948, authorities have not yet revised the basis for membership. Supplemental members with specific terms of office have been added, however.

The National Assembly

The National Assembly meets once every six years, mainly to amend the constitution and to elect the president and the vice president. As of January 1985, the National Assembly had 979 members, including 893 indefinite-term members elected on the mainland in 1947 (of the original 2,691); 12 indefinite-term members elected in 1969 from Taiwan; and 74 supplemental members (serving six-year terms) elected in 1980 from Taiwan, Quemoy (Kinmen), and Matsu. The National Assembly has an 85-member presidium (standing committee), which is elected by the National Assembly members at each session.

The Legislative Yuan

The Legislative Yuan, which passes legislation, exercises less legislative power than the U.S. Congress. It does not initiate legislation, but merely debates and votes on legislation submitted by the Executive Yuan.

As of January 1986, the Legislative Yuan had 338 members, including 239 indefinite-term members elected on the mainland in 1948 (of the original 773); 6 indefinite-term members elected in 1969 from Taiwan; and 67 supplemental members elected in 1983 from Taiwan, Quemoy (Kinmen), and Matsu; and 26 supplemental members appointed in 1983 by the president from overseas Chinese constituencies. Supplemental members serve three-year terms.

The Control Yuan

The Control Yuan supervises Taiwan's public officials. It is empowered to institute impeachment proceedings, to investigate Executive Yuan operations and those of subordinate organizations, and to propose corrective measures and/or to conduct field investigations and audits of public or private organizations based on complaints from the public.

As of January 1986, the Control Yuan had 71 members, including 39 indefinite-term members elected on the mainland in 1948 (of the original 180); 1 indefinite-term member elected in 1969; 22 supplemental members elected in 1980; and 10 supplemental members appointed in 1980 by the president from overseas Chinese constituencies. Supplemental members serve six-year terms.

The Executive Branch

At the central government level, the executive branch includes the Executive Yuan, the Judicial Yuan, and the Examination Yuan.

Government and Politics—Taiwan

The Executive Yuan

The Executive Yuan is Taiwan's highest administrative organ. The Executive Yuan Council (or Cabinet) consists of the premier, the vice premier, ministers of interior, foreign affairs, national defense, finance, education, justice, economic affairs, and communications, the chairmen of overseas Chinese, Mongolian, and Tibetan affairs, and seven ministers without portfolio. Cabinet meetings are held weekly to discuss and finalize statutory or budgetary bills and other matters for the Legislative Yuan, and matters of concern to more than one ministry or commission.

Agencies subordinate to the Executive Yuan are the Secretariat, the Government Information Office, the National Palace Museum, the Council for Economic Planning and Development, the Vocational Assistance Commission for Retired Servicemen, the Research, Development and Evaluation Commission, the National Science Council, the Atomic Energy Council, the National Health Administration, the Central Bank of China, the Council of Agriculture, the Central Election Commission, and the Council for Cultural Planning and Development.

The Examination Yuan

The Examination Yuan oversees the examination, employment, and management of civil service officials at all levels of government. It comprises the Council for Examination and the Ministries of Examination and Personnel.

Local Government

Local governments under the Jurisdiction of the Executive Yuan include the Taiwan provincial government, the Fujian provincial government, and Taipei and Kaohsiung city governments. The provincial governors are appointed, but members of the provincial assembly and county and city councils are elected to four-year terms.

Taxation

Taiwan has no single tax code. Rather, taxes fall under specific laws and are classified into national, provincial, or city taxes as shown in Table 1.

Table 1

TAX CLASSIFICATIONS--TAIWAN

National Taxes	Provincial Taxes	City Taxes
Income tax	Land tax	Building tax
Estate tax	Gross business receipts tax	Slaughter tax
Customs duty	Vehicle license tax	Amusement tax
Commodity tax	Stamp tax	Title deed tax
Stock transfer tax		
Mines tax		

Source: Dataquest
March 1987

The New Business Tax Law

A new business tax law implements two tax systems, the Gross Business Receipts Tax (GBRT) and the Value-Added Tax (VAT).

Tax is now levied on the basis of the value added to each sale, except for certain restaurants, financial institutions, and small-scale enterprises that are taxed on the basis of their gross business receipts.

The sale of goods and services, other business activities conducted at a price, and certain activities conducted without a price, such as donations or self-consumption of goods or services purchased, are taxable. Imported goods and services are also taxable.

Under the new law, there are four kinds of business taxpayers:

- A seller of goods or services

- A receiver or holder of imported goods (However, under the VAT system, a business person is exempt from paying tax at the time of import if the goods are for use in operations.)

- A purchaser of services rendered by a foreign enterprise, institution, or organization without a fixed place of business in Taiwan (However, under the VAT system, a business person is exempt from paying tax at the time of import if the services are for use in producing taxable goods or services.)

- A business agent of a foreign enterprise engaged in international transportation without having a fixed place of business in Taiwan

The tax rate categories are as follows:

- Regular rate (applicable to VAT system)--Not less than 5 percent or more than 10 percent

- Special rate (applicable to GBRT system)--5 percent for banks, insurance companies, trust and investment companies, securities traders, bill finance companies, and pawnshops, except reinsurance premium income, for which the rate is 1 percent

- Special restaurants--15 percent for night clubs and restaurants with entertainment programs; 25 percent for restaurants, tea houses, coffee shops, and bars with hostesses

- Small-scale enterprises--1 percent

Constitution

Taiwan's constitution, ratified late in 1947, has 175 articles in its 14 chapters.

Chapter 1 presents general provisions, including Dr. Sun Yat-sen's Three Principles of the People: nationalism, democracy, and well-being; and that the country is to be a "democratic republic of the people, to be governed by the people and for the people." This chapter also covers Chinese sovereignty, citizenship, territory, and racial equality.

Chapter 2 lists the citizens' rights and duties, including legal procedures the state must follow during arrest, trial, and punishment. Basic constitutional freedoms in Taiwan are speech, beliefs, residence, publication, privacy of correspondence, assembly, and association.

Chapter 3 outlines the organization and functions of the National Assembly, which is empowered to elect and recall the president and the vice president. It is also authorized to amend the constitution.

Chapter 4 is on the presidency, and Chapters 5 through 9 define the five branches of government.

Chapter 10 describes the distribution of power between the central government and local governments. National concerns such as military and diplomatic matters are in the Central Government's jurisdiction; areas such as education and health, the local governments', since the problems are often particular to a given region. Chapter 11 details the system of local government.

Government and Politics—Taiwan

Chapter 12 sets forth the four political powers of the people: suffrage, recall of officials, initiative, and referendum.

Chapter 13 describes fundamental national policies: national defense, foreign policy, economy, social security, education and culture, and the frontier regions.

Chapter 14 discusses the enforcement and amendment of the constitution.

POLITICS

Kuomintang Party (KMT)

Early History

The KMT, or Nationalist Party, has roots in Dr. Sun Yat-sen's Society for Regenerating China, formed among overseas Chinese in Honolulu on November 24, 1894. It remained largely a regional force until after Sun's death in 1925, when Generalissimo Chiang Kai-shek assumed Sun's mantle and, in 1926, launched the ultimately successful Northern Expedition against remaining warlords. In 1927, with Chiang's military victory only a year away, communists were expelled from the KMT for subversion, ensuring survival of Sun's Three Principles of the People as the predominant party ideology. Exigencies of the War of Resistance against Japan returned a communist presence to the KMT from 1937 to 1945, but at the end of World War II, the accommodation rapidly disintegrated into civil war. Sapped by the fight against Japan and unable to consolidate power against regional communist gains, the KMT followed the Nationalist administration to Taiwan in 1949.

Structure and Membership

Party organizations exist on five levels with vertical lines of control. These levels are central, provincial or special municipal, county or regular municipal, district, and individual party cells. Party membership totals about 2 million in some 160,000 cells of 3 to 31 members each. While civil servants constitute the largest single group in the party, a generally nonrestrictive membership policy has attracted significant numbers of party members from other walks of life, including workers, farmers, businessmen, students, retired servicemen, professionals, and housewives. Some 79 percent of the party membership is male, 65 percent is native Taiwanese, 60 percent is below the age of 40, 85 percent has at least a high school education, with 40 percent possessing a university degree.

Government and Politics--Taiwan

Recent Developments

When the authorities moved to Taiwan, they brought along the three "national" representative bodies--the National Assembly and the Legislative and Control Yuans--to buttress their claim to represent all of China. Later, the tenure of those elected on the mainland was made permanent, due to the inability of the authorities to hold further elections on the mainland.

Beginning in the early 1970s, Taiwan held elections for supplemental members to the three bodies, subject to reelection at either three- or six-year intervals. Representation by native Taiwanese of all persuasions has thus climbed sharply, but still remains limited. For example, 93 percent of the 71 candidates elected in the December 3, 1983, Legislative Yuan elections are native-born Taiwanese. The Taiwanese representation in the full Legislative Yuan still only amounts to 18 percent of the membership, however.

Similar ratios prevail in the other two bodies. The authorities are aware that age and attrition will continue to remove members, thereby increasing the number of Taiwanese representatives.

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Government and Politics--Hong Kong

GOVERNMENTAL STRUCTURE

Hong Kong is administered by the Hong Kong government, whose administration follows the basic pattern of all British-governed territories. The government is headed by a governor, who is appointed by the queen as her representative in Hong Kong. The governor directs Hong Kong's administration and acts as its titular commander in chief. The office derives its authority from the letters patent passed under the great seal of the United Kingdom. As head of the government, the governor presides over the meetings of both the Executive and Legislative Councils.

The Executive Council

The Executive Council (Exco) is the principal policy-making arm of the government and offers advice to the governor. Exco's 16 members include 4 ex-officio members (the chief secretary, the commander of British forces, the financial secretary, and the attorney general) and 12 appointed members (2 government officials and 10 others). The council meets once a week, and although many of its decisions are made public its proceedings remain confidential.

The Legislative Council

The Legislative Council approves and/or amends bills and other policy decisions. The council has 3 ex-officio members--the chief secretary, the financial secretary, and the attorney general--plus 7 other official members and 22 appointed members who are not government officials. In addition, the council has 24 elected members. Of these, 12 represent geographical constituencies and 12 represent functional constituencies such as commerce, labor, education, and medicine.

UMELCO

UMELCO (Unofficial Members of the Executive and Legislative Councils), an important government subgroup, acts as watchdog over the administration. With its own office and administrative staff, UMELCO has access to government documents and senior officials, which enables it to handle complaints and formal protests from the public on the whole range of governmental activity.

The Judiciary

Hong Kong closely follows the English principle of a completely independent judiciary. English common law and rules of equity are enforced in Hong Kong, though local circumstances are taken into account. The chief justice and High Court and appeal judges are appointed by the governor on instruction from the queen. District judges and magistrates are also appointed by the governor. The High Court's jurisdiction is similar to that of the English High Court. The Court of Appeal, the highest court in Hong Kong, consisting of the chief justice and two justices of appeal, hears cases from the High Court and district courts. Appeals from this court may be taken to the Judicial Committee of the Privy Council in London.

The Government Secretariat

The Government Secretariat is organized into 11 policy and 2 resources branches as follows:

- Policy branches
  - Home Affairs
  - City and New Territories Administration
  - Housing
  - Education and Manpower
  - Lands and Works
  - Security
  - Health and Welfare
  - Transport
  - Economic Services
  - Monetary Affairs
  - Trade and Industry
- Resources branches
  - Civil Service
  - Finance

The chief secretary is the governor's principal policy adviser, the chief government executive, and the head of the Civil Service. His office, the Government Secretariat, coordinates and supervises the work of all government departments.

The financial secretary is responsible for financial and economic policy and supervises departments primarily involved in this field.

The departments that are of primary interest to foreign investors are discussed in the next two sections.

Industry Department

The Industry Department comprises the Environment and Resources Division, the Industrial Development Division, the Promotion Consultancy Division, the Science and Technology Division, and the Technical Support Division. It assists industry in its relations with other government departments, deals with specific issues affecting industry, monitors the domestic oil supply, determines policy aspects of industrial investment promotion, advises the government on industrial land matters, evaluates the establishment of manufacturing projects in Hong Kong, and advises on the provision of industrial support facilities and technical backup services, the transfer of technology, and R&D.

Trade Department

The Trade Department is responsible for Hong Kong's commercial relations with foreign governments and is made up of five divisions. Three handle bilateral commercial relations with trading partners; their duties are divided geographically and include trade negotiations and the implementation of textile agreements. A fourth division manages the multilateral aspects of external commercial relations, including Hong Kong's participation in the General Agreement on Tariffs and Trade and negotiation of the Multi-Fibre Arrangement. The fifth division deals with common services, origin certificates, import and export licensing for commodities other than textiles, and a rice control scheme.

Financial Structure

Unlike most major economies, Hong Kong has no central bank. Most of the functions a central bank would perform are carried out by government offices or selected commercial banks. The banking sector has a three-tier structure made up of licensed banks, licensed deposit-taking companies, and registered deposit-taking companies. At the end of 1985, Hong Kong had 140 licensed banks, 44 of which were locally incorporated. These banks maintained 1,547 offices in Hong Kong. In addition, foreign banks maintained 112 representative offices. At the same time, 33 licensed deposit-taking companies and 311 registered deposit-taking companies carried out restricted banking activities.

Hong Kong's stock market, with 1,300 registered securities dealers and nearly 400 investment advisers, is highly developed and international in character. Public offerings at market price are common, as are listings of preferred stocks. Foreign investment is open, and some foreign firms have their stocks listed in Hong Kong. On the other hand, 10 Hong Kong stocks are quoted and traded in London.

Hong Kong has no controls of any kind on the movement of funds into and out of the territory for any purpose.

Hong Kong's excellent banking and financial facilities played a vital role in the territory's growth from an intermediary trade center to a major manufacturing center. The government has also continually worked toward providing a favorable environment, which, with Hong Kong's favorable geographical position and excellent communications network, has helped to develop the territory into a leading financial center.

Taxation

The following taxes and duties are levied by the government and collected by the Inland Revenue Department: betting duty, entertainment tax, stamp duty, and earnings and profits tax. No general tariff is imposed on goods entering Hong Kong, but duties are charged on six groups of commodities--liquor, tobacco, certain hydrocarbon oils, methyl alcohol, cosmetics, and nonalcoholic beverages--whether they are imported or manufactured locally. No tax is levied on income or profits arising abroad, even if they are remitted to Hong Kong. There are no bilateral tax treaties with the United Kingdom or any other country. However, there is limited tax relief on income taxable in Hong Kong that has already been taxed in another Commonwealth territory.

Because of the uniformly low tax rates, Hong Kong has no tax holidays or other incentives for prospective investors, except for a 55 percent first-year capital allowance on newly purchased plants and machinery used to produce profits taxable in Hong Kong. Annual tax allowances ranging between 10 and 30 percent are also available.

Profits Tax

Profits tax rates are currently 18.5 percent for corporations and 17 percent for other entities, resident and nonresident alike. Dividends received from corporations subject to Hong Kong profits tax are excluded from the assessable profits of the recipients.

Salary Tax

The taxable income is limited to income arising in and derived from Hong Kong, after various deductions that vary with individual circumstances. The salary tax is charged on a sliding scale from 5 percent on the first HK$10,000 (US$1,282) of taxable income per year up to 25 percent on taxable income of more than HK$50,000 (US$6,410). However, the salary tax on any person may not exceed 17 percent of his or her total income before deduction of allowances.

Property Tax

Property tax is levied on noncorporate owners of rental property at the rate of 17 percent of the annual rent, subject to adjustment for management charges or other expenses incurred by a property owner. In addition, a 20 percent deduction for repairs is granted. Rent from corporately owned property is taxed under the profits tax, not under the property tax. Owner-occupied property is exempt from property taxation.

POLITICS

Current Political Perspective

Entrepreneurial investment in Hong Kong has been weak in recent years due to uncertainties raised by the Sino-British Joint Declaration that China will resume sovereignty over Hong Kong on July 1, 1997, when Britain's lease on the New Territories expires. The expiration of the lease had long been a topic in Hong Kong, but not until the late 1970s did it become an issue when it began to hamper economic development and domestic investment in Hong Kong. Because 15-year home mortgages were the norm in Hong Kong at that time, 1982 was a critical year for some type of settlement over Hong Kong's fate to be reached. The big property developers were especially eager to settle the issue, with the hope that the Chinese would allow the British to continue their rule in Hong Kong.

During the period of confidential talks leading to the Joint Declaration, Hong Kong experienced a serious confidence crisis as many people tried to emigrate to other countries, principally the United States, Australia, Canada, and some small Central American states. This lack of confidence in Hong Kong's future also led to a property market collapse and a run on local currency, forcing the Hong Kong government to peg its currency to the U.S. dollar in late 1983 at a fixed exchange rate of HK$7.8 to US$1.

Government and Politics--Hong Kong

Some aspects of the Joint Declaration kindled a certain amount of confidence in Hong Kong's future. China has indicated its willingness for Hong Kong to retain its capitalist system in a basically unchanged form for 50 years after 1997. However, questions remain, particularly concerning conscription, the stationing of troops in Hong Kong, and possible incompatibility between the People's Republic of China constitution and the forthcoming Basic Law, which will form the basis of Hong Kong's legal system.

To alleviate possible problems, a Sino-British Joint Liaison Group was formed to ensure a smooth transition, and a Land Commission was established to facilitate the allocation and sale of land in the territory during the transition period. The Basic Law Drafting Committee members from Hong Kong and China have been meeting to exchange views on the spirit and content of the Basic Law for what will become the Special Administrative Region of Hong Kong.

In 1985, China reacted negatively to a 1984 Hong Kong government white paper on future development of representative government in Hong Kong by declaring that "somebody" had deviated from the Joint Declaration. This announcement caused Hong Kong share prices to plunge. The white paper proposed the gradual development of a governmental system that would derive its authority from the community and would be directly accountable to the people of Hong Kong. The first step toward the adoption of this system was an indirect election system based on electoral colleges and functional constituencies introduced in 1985 for electing members who are not government officials to the Legislative Council. The new system will be reviewed this year.

Dataquest believes that at present, the local entrepreneurs' will to reinvest in Hong Kong is still fairly weak. They are concerned that once China takes control, it will disregard the agreement's policies. Nevertheless, the people of Hong Kong are hopeful that the Basic Law will be the key to their future. The drafting of the Basic Law, done in secrecy, is being closely watched for clues to China's real intentions for Hong Kong, and rumors concerning it will influence medium-term economic and financial strategies. Fortunately, so far the Hong Kong members of the Drafting Committee have made strong efforts to secure a workable constitution for Hong Kong. For this reason, hopes are that confidence will gradually improve along with the will to reinvest in Hong Kong.

Government and Politics--Singapore

Singapore employed 70,001 people in its public sector as of January 1, 1987. Government employees by ministry are as detailed in Table 1.

Table 1

Government Employees by Ministry—Singapore (January 1, 1987)*

Ministry	No. of Employees
President's Office	60
Prime Minister's Office	46
Departments under PMO	83
Ministry of Finance	3,600
Ministry of the Environment	2,797
Ministry of Law	633
Ministry of Home Affairs	13,909
Ministry of Communications and Information	1,000
Ministry of Labour	541
Ministry of Defence	1,299
Ministry of National Development	3,502
Ministry of Trade and Industry	407
Ministry of Health	13,944
Ministry of Foreign Affairs	369
Ministry of Community Development	1,227
Ministry of Education	25,765
Departments Not under Any Ministry	819
Total	70,001

*Figures were supplied by the Computer Services Department based on the Central Pay Office (CPO) Master File. Payrolls that were transferred between ministries in 1986 were not reflected in the figures if CPO had not made the necessary adjustments.

Source: Information Division
Ministry of Communications
and Information

PARLIAMENT

Singapore's unicameral Parliament consists of 79 elected members. Every citizen over 21 years is eligible for election to Parliament, subject to certain qualifications. Voting in an election is compulsory. The life of a Parliament is five years from the date of its first sitting, unless it is dissolved earlier. A general election must be held within three months after a dissolution. Parliamentary sessions are presided over by the speaker, who is a member of Parliament elected by its own members that are neither ministers nor parliamentary secretaries, or from among persons that are not members of Parliament but are qualified to be elected as members of Parliament. The present speaker is an elected member of Parliament.

Although Parliament meets periodically; there are no scheduled dates of sittings. Business conduct is governed by procedures adapted from those of the English House of Commons. Members may speak in Malay, Mandarin, Tamil, or English. Simultaneous interpretation is provided. Parliament's sittings are open to the public.

The privileges, immunities and powers of Parliament and of the speaker, members, and committees are defined in the Parliament (Privileges, Immunities, and Powers) Act.

THE JUDICIARY

The judicial power in Singapore is vested in its Supreme Court and in the subordinate courts. The judiciary administers the law independently of the executive branch, and this independence is safeguarded by the Constitution of the Republic of Singapore.

The Supreme Court consists of the High Court, the Court of Appeal, and the Court of Criminal Appeal. The chief justice and the other judges of the Supreme Court are appointed by the president, acting on the advice of the prime minister. Before giving advice about the appointment of a judge, other than the chief justice, the prime minister consults with the chief justice. There are eight judges (inclusive of the chief justice) on the Supreme Court. On July 1, 1986, Singapore's first judicial commissioner was appointed.

The Supreme Court also has a registrar, a deputy registrar, a senior assistant registrar, and assistant registrars, who perform both administrative and judicial functions.

The subordinate courts consist of district courts, magistrates' courts, juvenile courts, coroners' courts, and, from February 1, 1985, the Small Claims Tribunal, which was set up under the Small Claims Tribunal Act, passed in Parliament in August 1984. District judges, magistrates, and coroners are appointed by the president on the recommendation of the chief justice. Subordinate courts also have a registrar and deputy registrars. As of March 1, 1986, the jurisdiction of the subordinate courts was enlarged. The lower courts are as follows:

- District courts and magistrates' courts have original criminal and civil jurisdiction. District courts now try offenses for which the maximum term of imprisonment does not exceed 10 years. In civil cases, they have jurisdiction where the amount claimed does not exceed $50,000.

- Magistrates' courts continue to try offenses for which the maximum term of imprisonment does not exceed three years. They also inquire into offenses with a view to committal for trial by the High Court. The jurisdiction of magistrates' courts in civil cases has been increased from $2,000 to $10,000.

- Juvenile courts deal with offenses alleged to have been committed by children or young persons. A child is a person under the age of 14, and a young person is one who is between 14 and 16 years of age.

- A coroner's court holds inquiries into deaths under suspicious or unknown circumstances.

- The small claims tribunal's jurisdiction is for claims of $2,000 or less.

The High Court has unlimited original jurisdiction in both criminal and civil cases. All criminal cases involving capital punishment must be tried there.

There is an avenue of appeal to a High Court judge in chambers from any judgment or decision of the Supreme Court registrar. In its appellate jurisdiction, the High Court also hears criminal and civil appeals from the district courts and the magistrates' courts. In addition, the High Court has general supervisory and revisionary jurisdiction over the subordinate courts.

The Court of Appeal hears appeals from any judgment or order of the High Court in any civil matter, whether made in the exercise of its original or its appellate jurisdiction.

The Court of Criminal Appeal hears appeals from decisions made by the High Court in the exercise of its original criminal jurisdiction. It also determines questions of law reserved for its decision by the High Court.

Appeals from the Court of Appeal and the Court of Criminal Appeal lie to the judicial committee of the Privy Council, which is the final appellate court of Singapore, although the proceedings are conducted in the United Kingdom.

THE EXECUTIVE BRANCH

The Republic of Singapore's president is elected by Parliament for a term of four years. The president appoints a prime minister, on whose advice other ministers are appointed from among the members of Parliament to form a cabinet. The cabinet, responsible collectively to Parliament, consists of the prime minister and 14 other ministers.

Presidential Council for Minority Rights

The Presidential Council for Minority Rights consists of a chairman appointed for a period of three years, not more than 10 permanent members appointed for life, and not more than 10 other members each appointed for a period of three years. Appointment of the chairman and members is made by the president on the advice of the cabinet. Any citizen 35 years or over who resides in Singapore is eligible for appointment to the council, provided he or she is not debarred by certain disqualifications.

Bills passed by Parliament are required with certain exceptions to be submitted to the council before they are presented to the president. Subsidiary legislation must also be sent to the council within 14 days of publication.

The council's function is to draw attention to any bill or subsidiary (local) legislation which, in its opinion, is disadvantageous to members of other communities, either directly by prejudicing a community or by giving advantage to members of another community. The council also reports on matters affecting persons of any racial or religious community in Singapore.

The Prime Minister's Office

The Prime Minister's Office oversees the Corrupt Practices Investigation Bureau and the Elections Department. It watches over religious affairs, national honors and awards, the use of the national flag and anthem, and the appointment of justices of the peace.

Ministry of Defence

The Ministry of Defence (MINDEF) is responsible for national defense and security, the development of the military, the command and control of the armed forces, and the management of government-owned defense companies.

Ministry of Law

The Ministry of Law deals with legal affairs and legislation, constitutional matters, lands, surveys, registration of titles and deeds, statutory petitions, administration of islands and Malayan settlements, patents and trademarks, pawnbrokers and moneylenders, legal aid and advice, and the appointment of juvenile court advisors.

Departments directly under this ministry are the Office of the Official Assignee and Public Trustee, the Registry of Trademarks and Patents, the Registry of Pawnbrokers, the Registry of Moneylenders, the Land Office, the Registry of Titles and Deeds, the Survey Department, the Appeals Board (Land Acquisition), the Legal Aid Bureau, and the Computer Information Systems Department.

Ministry of National Development

The Ministry of National Development is responsible for the physical development of Singapore. Its major development responsibilities cover public and middle-income housing, urban redevelopment, public works, primary production, and parks and recreational facilities. Its major regulatory functions include state and city planning, development, and building control; parking lot management; and the import and export of agricultural and animal produce.

Its other functions include regulating the maintenance and management of buildings and common properties, controlling the development of infrastructure in urban and rural areas, promoting the expansion and improvement of construction capabilities, and research and collation of statistics on the building industry and the property sector.

The ministry's policies are executed by its four departments namely the Public Works, Planning, Primary Production, and Parks and Recreation, and its five main statutory boards, Housing and Development Board, Urban Redevelopment Authority, Construction Industry Development Board, Preservation of Monuments Board, and Nature Reserves Board.

Ministry of Foreign Affairs

The Ministry of Foreign Affairs is concerned with conducting relations with foreign governments; promoting economic progress, security, and regional cooperation; assuring peace and prosperity; and maintaining and consolidating friendly relations with all countries.

Ministry of Education

The Ministry of Education formulates and implements educational policies. It has overall control of the development and administration of government and government-aided primary and secondary schools and junior colleges. It also supervises private schools.

The National University of Singapore, the Nanyang Technological Institute, the Institute of Education, the Singapore Polytechnic, the Ngee Ann Polytechnic, the Vocational and Industrial Training Board, the Institute of Southeast Asian Studies, and the Singapore Science Center are statutory bodies responsible to their own governing boards, but they are under the overall policy direction of the ministry.

Ministry of the Environment

The Ministry of the Environment is responsible for protecting and improving the environment. The principal Acts administered by the ministry are the Environmental Public Health Act (Cap 155); the Water Pollution Control and Drainage Act, 1975; the Clean Air Act, 1971; the Sale of Food Act, 1973; the Destruction of Disease-Bearing Insects Act (Cap 152), and the Infectious Diseases Act, 1976. It administers legislation covering areas such as hawkers, food handlers, and food establishments; refuse disposal; public nuisances; air and water pollution; and standards for sanitary appliances, plumbing, and other environmental public health problems.

Ministry of Communications and Information

The Ministry of Communications and Information is responsible for the development and promotion of Singapore as a center of communications in the region, and for the provision of effective and efficient air, land, and sea transportation systems. It is also responsible for the government's overall public relations and publicity activities. The subsidiary departments are the Board of Film Censors, the Marine Department, the Meteorological Services Department, and the Registry of Vehicles. Statutory boards under its auspices are the Civil Aviation Authority, the Mass Rapid Transit Corporation, the National Maritime Board, the Port of Singapore Authority, the Singapore Broadcasting Corporation, and the Telecommunications Authority.

Ministry of Home Affairs

The Ministry of Home Affairs is responsible for administration of the police force, the Internal Security Department, the Prisons Department, the fire service, the Immigration Department, the Central Narcotics Bureau, the Civil Defence Force, and the National Registration Department.

Two statutory boards, the Commercial and Industrial Security Corporation and the Singapore Corporation of Rehabilitative Enterprises, are also the ministry's responsibility.

The ministry deals with crime prevention and detection, internal security, police national service, road safety, traffic control, civil defense, fire and ambulance services, penal matters, enforcement against drug trafficking and abuse, immigration, citizenship, identity cards, births and deaths, and registration of societies.

Ministry of Finance

The Ministry of Finance has three divisions—Budget, Revenue, and Public Service—each with its own permanent secretary.

Budget Division

The principal functions of the Budget Division are budget management and expenditure control. The departments it oversees are the Accountant General, Central Supplies, Computer Services, and Management Services, as well as the National Computer Board.

Revenue Division

The Revenue Division formulates the government's revenue policies and manages its assets and liabilities. It oversees the regulation of banking, financial, and commercial activities that promote Singapore as a competitive and progressive international financial and business center. It also deals with matters relating to the International Monetary Fund, the International Bank for Reconstruction and Development, and the Asian Development Bank.

Under its charge are the Inland Revenue Department, Customs and Excise Department, Commercial Affairs Department, and Registry of Companies and Businesses. The statutory bodies it controls include the Board of Commissioners of Currency, the Monetary Authority of Singapore, and the Post Office Savings Bank.

Public Service Division

The Public Service Division is responsible for schemes of service, terms and conditions of service, personal development and training, pay research and related studies, and professional information and placement service and social development. The Civil Service Institute comes under this division.

Ministry of Health

The Ministry of Health, with overall responsibility for Singapore's health policies, administers government health care services through the Hospital, Primary Health, and Dental Divisions, which are supported by other paramedical and ancillary services. It works closely with the Ministry of the Environment in the maintenance of environmental hygiene and the control of communicable diseases.

Ministry of Labour

The Ministry of Labour is responsible for matters pertaining to industrial relations, employment services, terms of employment and conditions of service, social security, industrial safety and health, public holidays, regulation of foreign workers, labor statistics, and regional and international cooperation on labor matters.

The Central Provident Fund Board, the International Arbitration Court, and the National Wages Council are in this division.

Ministry of Community Development

The Ministry of Community Development is responsible for community relations programs, social welfare services, cultural development programs, library services, archives and oral history services, monitoring of feedback on government policies and their effects on the people, sports promotion, and physical fitness programs. The services are provided through several departments and statutory boards.

Ministry of Trade and Industry

The Ministry of Trade and Industry is responsible for economic planning and research, manpower planning, regional and international economic policies, domestic and external trade policies, export promotion, supply and control of essential commodities, shipping and freight, industrial policy, investment promotion, investment guarantee agreements, research and development policy, energy policy, tourism promotion, productivity and postemployment training, and statistical development. The ministry headquarters comprise five operational units: the Domestic Trade Unit, the Economic Planning Unit, the International Trade Unit, the Industrial Policy Unit, and the Economic Research Unit. It encompasses the following departments and statutory boards: the Department of Statistics, the Department of Computer Information Services, the Trade Development Board, the Economic Development Board, the Jurong Town Corporation, the National Productivity Board including Skills Development Fund, the Public Utilities Board, the Singapore Tourist Promotion Board, the Sentosa Development Corporation, the Singapore Institute of Standards and Industrial Research, the Rubber Association of Singapore, the Science Council of Singapore, and the Hotels Licensing Board.

Attorney General's Chambers

The attorney general is the principal legal advisor to the government, advising on legal matters and performing legal duties assigned by the president or the cabinet. As the public prosecutor, the attorney general is empowered to institute, conduct, or discontinue any criminal proceedings. The attorney general is also responsible for drafting legislation, and is assisted in this area by the solicitor general, the Parliamentary Council, and other legal officers. The Attorney General's Chambers has three divisions: Legislation, Civil, and Crime.

The Legislation Division handles the drafting of bills to be introduced in Parliament and of subsidiary legislation. The Civil Division deals with all civil cases involving the government. It also renders legal advice to ministries and departments, and drafts and evaluates all government contracts and agreements. The Crime Division handles criminal cases in court. It also gives legal advice to the police and other law enforcement agencies on matters relating to their investigations.

The Audit Department

The Audit Department acts as a watchdog for Parliament, reporting cases of noncompliance with laws and regulations, weaknesses in financial control, and wasteful use of resources. Such cases, among others, are usually highlighted in the Annual Report of the Auditor General, which is presented to Parliament and examined by the Public Accounts Committee.

This independent body functions under the Audit Act without interference from any ministry or department. The auditor general is appointed by the president on the advice of the prime minister after consultation with the chairman of the Public Service Commission. There are safeguards in the act to ensure that the auditor general can perform official duties independently without fear or favor.

Government ministries and departments are audited on a selective basis. Projects are carried out with specific audit objectives. Apart from this, 26 statutory boards and 50 public enterprises are audited annually by the department. Surveillance audits are also carried out on statutory boards audited by commercial auditors.

Public Service Commission

The Public Service Commission consists of a chairman and between 5 and 11 members appointed by the president on the advice of the prime minister. Its functions include the appointment, confirmation, promotion, and placement of the permanent or pensionable establishment; and transfer and discipline of all public officers except for those in the judicial and legal services, police officers below the rank of inspector, and daily rated employees.

The Public Service Commission also handles the planning and administration of scholarships offered by the government, foreign governments, and local and foreign organizations and foundations. These awards are for nonserving officers.

Government and Politics--China

GOVERNMENT STRUCTURE

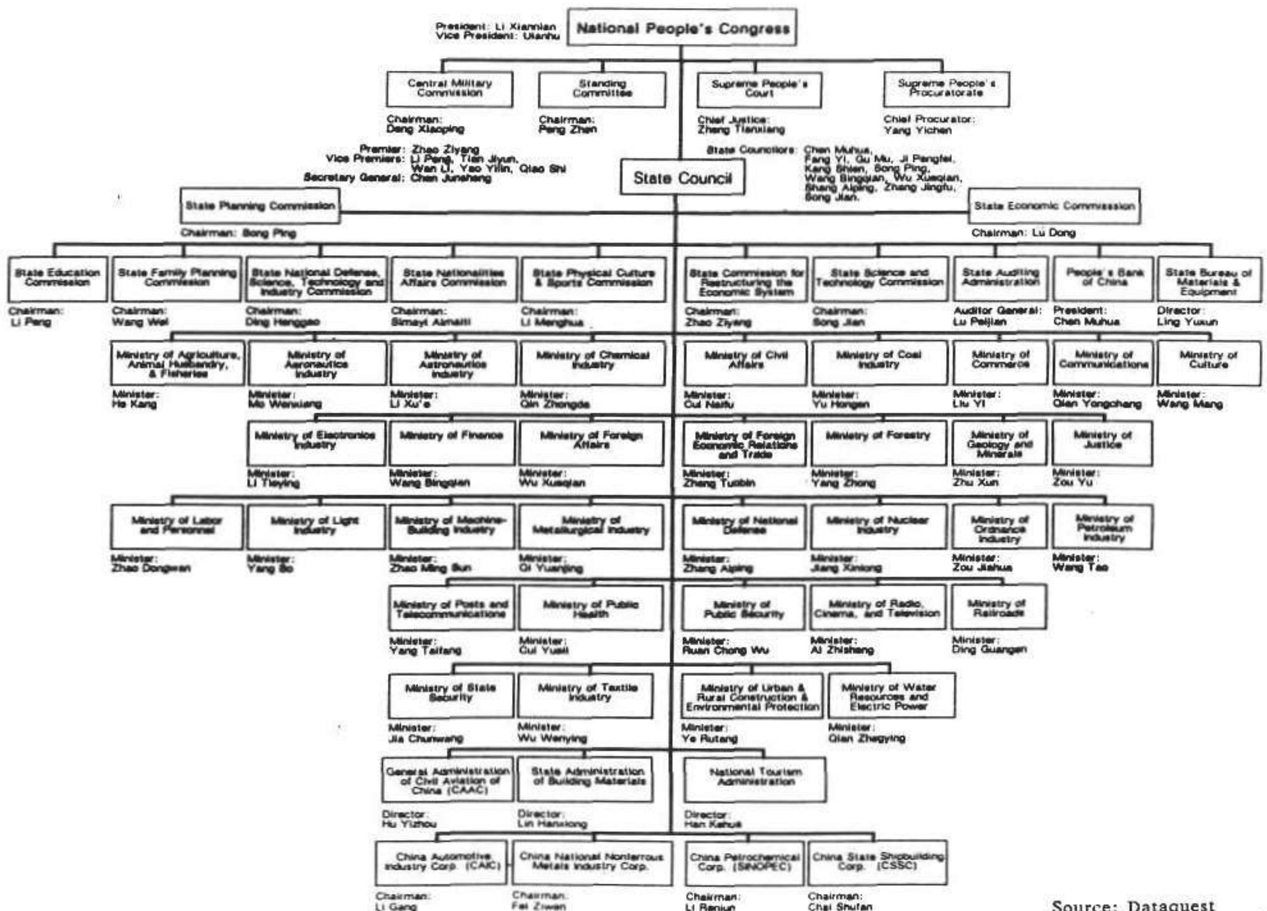
The People's Republic of China is a socialist state. Its state organs include:

- Organs of state power--the National People's Congress and the local people's congresses at different levels
- The president of the state
- State administrative organs--the State Council and the local people's governments at different levels
- The Central Military Commission
- The state judicial organ--the people's courts
- The state organ of legal supervision--the people's procuratorates

Figure 1 shows China's governmental structure.

Figure 1

CHINA'S GOVERNMENTAL STRUCTURE



Source: Dataquest
September 1987

THE NATIONAL PEOPLE'S CONGRESS

China's National People's Congress is the highest organ of state power. Only the National People's Congress can amend the constitution, make laws, and determine major issues in the country's political life.

The National People's Congress is composed of deputies elected by the provinces, autonomous regions, and municipalities directly under the Central Government, and by the armed forces. The deputies include people from all nationalities, all democratic parties, people's organizations, and classes. The composition of the Sixth National People's Congress is shown in Table 1. Of these, 632 or 21.2 percent are women, and 403 or 13.5 percent are minority nationalities, each with their own deputies. See Table 2 for information about People's Congresses to date.

The National People's Congress is elected for a term of five years. It meets once a year and usually issues announcements and press communiques during its session, publishing relevant documents and information about the session and its results.

Table 1

SIXTH NATIONAL PEOPLE'S CONGRESS--CHINA

Deputies	Number	Percentage
Workers and Peasants	791	26.6%
Cadres	636	21.4
Intellectuals	701	23.5
Democratic Party Members and Democrats without Party Affiliation	543	18.2
People's Liberation Army	267	9.0
Returned Overseas Chinese	40	1.3
Total	2,978	100.0%

Source: Dataquest
September 1987

Table 2

NATIONAL PEOPLE'S CONGRESS--CHINA

Congress	Time*	Place	Number of Deputies
First	Sept. 15-28, 1954	Beijing	1,226
Second	April 18-28, 1959	Beijing	1,226
Third	Dec. 21, 1964-Jan. 4, 1965	Beijing	3,040
Fourth	Jan 13-17, 1975	Beijing	2,885
Fifth	Feb. 26-March 5, 1978	Beijing	3,497
Sixth	June 6-21, 1983	Beijing	2,978

*The time of the first session

Source: Dataquest
September 1987

THE PRESIDENT OF THE STATE

China's president and vice president are elected by the National People's Congress. Their terms of office are five years, and they are allowed no more than two consecutive terms.

THE STATE COUNCIL

The State Council is the executive body of the highest organ of state power as well as the highest organ of state administration. The State Council is responsible to the National People's Congress, or, when the National People's Congress is not in session, to its Standing Committee.

The State Council is composed of the following members:

- Premier
- Vice premiers
- State councillors
- Ministers in charge of ministries

- Ministers in charge of commissions
- Auditor general
- Secretary general

The premier has overall responsibility for the State Council and directs its work, assisted by the vice premiers and state councillors. The premier, vice premiers, and state councillors serve no more than two consecutive terms, which are five years in length.

The State Council has under it 37 ministries and 8 commissions. The 37 ministries are:

Foreign Affairs
Public Security
Civil Affairs
Finance
Foreign Economic Relations and Trade
Forestry
Water Resources and Electric Power
Geology and Mineral Resources
Metallurgical Industry
Nuclear Industry
Electronics Industry
Astronautics Industry
Petroleum Industry
Textile Industry
Railways
Posts and Telecommunications
Culture
Education
Auditing Administration
Xinhua News Agency
National Defense
State Security
Justice
Commerce
Agriculture, Animal Husbandry, and Fishery
Urban and Rural Construction and Environmental Protection
Machine-Building Industry
Aeronauics Industry
Ordnance Industry
Coal Industry
Chemical Industry
Light Industry
Communications
Labor and Personnel
Radio and Television
Public Health
People's Bank of China

The eight commissions are:

State Planning Commission
State Commission for Restructuring Economic System
Commission of Science, Technology, and Industry for National Defense
State Physical Culture and Sports Commission
State Economic Commission
State Science and Technology Commission
State Nationalities Affairs Commission
State Family Planning Commission

There are also organs directly under the State Council responsible for the work in specialized fields:

State Bureau of Goods and Materials
State Bureau of Price Control
State Bureau of Statistics
General Bureau of Industrial and Commercial Administration
General Customs Administration
State Bureau of Meteorology
General Administration of Civil Aviation
State Bureau of Oceanography
State Bureau of Seismology
State Bureau of Travel and Tourism
Committee for Reforming the Chinese Written Language
Bureau of Religious Affairs of the State Council
State Achives
Government Offices Administration Bureau of the State Council
Office of Councillors of the State Council
Office of Overseas Chinese Affairs of the State Council

THE CENTRAL MILITARY COMMISSION

China established the Central Military Commission to direct the armed forces of the country. It is composed of the chairman, the vice chairman, and members, all of whom serve five-year terms. The chairman is responsible to the National People's Congress and its Standing Committee.

THE LOCAL PEOPLE'S CONGRESS AND PEOPLE'S GOVERNMENTS

Figure 2 shows the administrative division of China, which is as follows:

- The whole country is divided into provinces, autonomous regions, and municipalities directly under the Central Government

- Provinces and autonomous regions are divided into autonomous prefectures, counties, autonomous counties, and cities

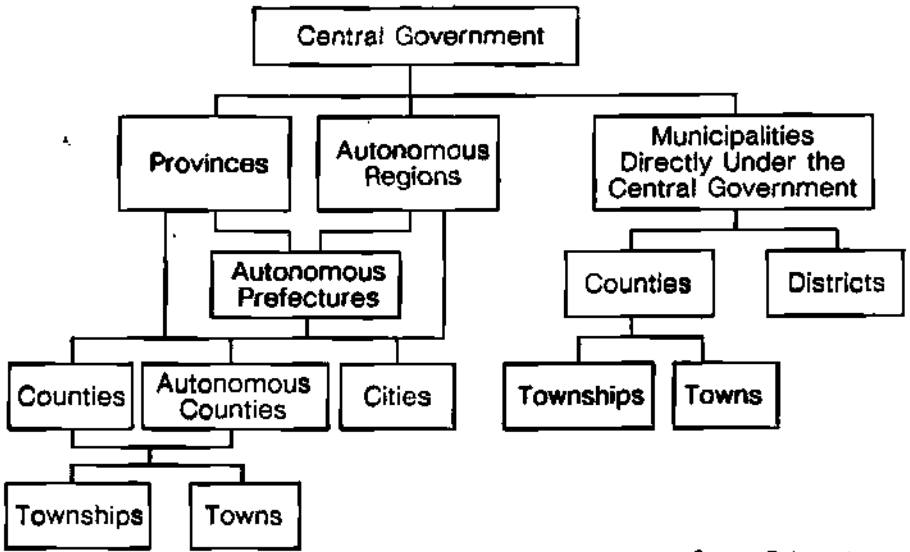
- Counties and autonomous counties are divided into townships, nationality townships, and towns

- Municipalities and major cities are divided into districts and counties

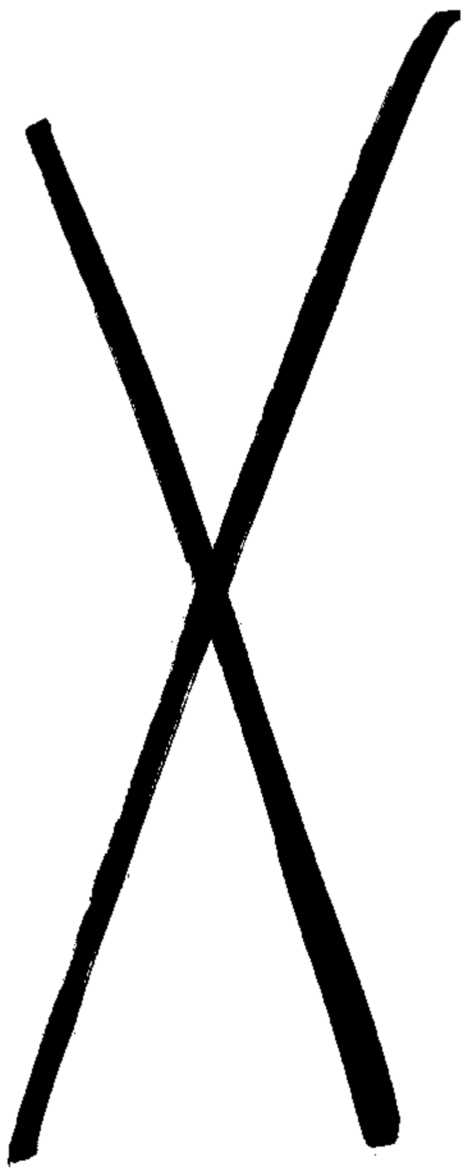
The state establishes local people's congresses and the local people's governments in the above-mentioned administrative areas.

Figure 2

CHINA'S ADMINISTRATIVE DIVISION



Source: Dataquest
September 1987



Industrial Policy--South Korea

OVERVIEW

During the last two decades, South Korea has made significant economic progress. A rapidly expanding economy has increased markets for domestic products. Although the oil price increases have created difficulties for the economy, the South Korean GNP has risen steadily during the 1980s. The 1982 GNP rose 5.6 percent over 1981, and 1984 was 7.7 percent higher than 1983. The government will continue its long-term economic development plan without significant deviation from its original objectives. With a growing economy, South Korea currently offers substantial investment opportunities, particularly in electronics and semiconductors.

While South Korea has no significant natural resources, its abundant labor force provides one of the country's most important assets. This well-educated labor force has proven to be easily trainable, productive, highly motivated, and dedicated to working. The tax incentives offered to assist targeted industries are considered better than those offered by other developing countries. Also, the government gives strong tax and banking incentives for export promotion. Repatriation of capital and profit remittances are legally guaranteed, and the property of foreign investors is protected by law. Adequate electricity, transportation, communication, industrial water, and industrial estate infrastructural facilities have been developed for high-technology manufacturing industries.

The following section describes the South Korean government's strategy for attracting and supporting industrial development. It includes the financial incentives offered to non-Korean investors and the project application process. Direct foreign investment in South Korea is described. Other sections discuss the work force and the industrial infrastructure.

INDUSTRIAL DEVELOPMENT STRATEGY

Quality has become increasingly important in the international electronics marketplace. To achieve this, strengthening the industrial infrastructure and raising the level of technology are essential. South Korean industrial policy reflects these goals. This policy includes free market competition, increased levels of research and development, support for small and medium-size industrial companies, and acknowledgment of industrial leaders. The South Korean government supports a range of programs designed to make the country a significant participant in the world's high-technology marketplace. The following sections describe the programs and policies that are most relevant to the South Korean electronics industry.

Industrial Policy—South Korea

Science and Technology Investment

Under the current economic plans, the ratio of the government's science and technology investments against its GNP rose from 0.89 percent in 1981 to 2 percent in 1986. South Korea's level of investment as a percent of GNP approaches that of the world's industrial leaders. West Germany tops the list with a ratio of 2.7 percent, followed by the United States at 2.6 percent and Japan at 2.4 percent. South Korea's industrial development strategy calls for creating a special technology development fund. This fund, estimated at $380 million, is earmarked to finance specified science and technology projects over the five-year period of the current economic plan (1982 through 1987).

The Ministry of Science and Technology developed a list of target industries, and has asked private businesses and government research institutions to place emphasis on developing 635 technologies essential to promote the target industries. The target industries are:

- Semiconductor
- Computer
- Biochemical
- Precision machinery
- Bioengineering
- Materials
- Textiles
- Energy and resources
- Plant engineering industries

The government also offers financial and technological support to venture groups seeking to establish technology-intensive businesses.

Tax Incentives

South Korean tax law grants a variety of tax incentives, including reduced corporate and individual income taxes, five-year tax holidays, and additional first-year depreciation or special depreciation allowances designed to encourage certain capital expenditures. Exporting firms are allowed special reserves for the development of overseas markets. These firms are also allowed certain deductions from revenue received from foreign transactions.

Further temporary tax incentives are granted under the Foreign Capital Inducement Act (FCIA) of 1982. This law states that a foreign investment company is fully exempt from income taxes on the portion of taxable income attributable to its South Korean investment for a period of five years. After the five year-period, the exemption is reduced to 50 percent for the next three years.

Under the FCIA, a foreign investment company is also exempt from property and sales acquisition taxes in the same manner as stated above; that is, 100 percent exemption for the first five years and a 50 percent exemption for the succeeding three years. Interest and related income from foreign-currency loans are tax exempt.

Further, the FCIA states that royalties to foreigners are fully exempt from income taxes for five years from the date of government approval and are 50 percent exempt for the succeeding three years.

Foreign Investment

As stated in the FCIA, the government's fundamental policy regarding foreign capital is ". . . to effectively induce and protect foreign capital conducive to the sound development of the national economy and the improvement of the international balance of payments, and to properly manage such foreign capital."

Based on this policy, the South Korean government has developed policies to attract and protect vital foreign investment. Government policy promotes economic cooperation with foreign countries, strengthens the international competitiveness of the nation's industries, and fosters development of advanced technology.

In addition, the government has revised the FCIA, introducing an automatic approval system and a negative list system that more clearly define desirable projects. These revisions effectively simplify the authorization procedure for some projects. Further, by stating those projects not eligible for support, the negative list system has substantially broadened the range of projects that may be considered.

The level of direct foreign investment in South Korea is increasing. As shown in Table 9 in the South Korean section of "Demography and Economy," total foreign direct investment for the 22-year period from 1962 through 1984 was US$2.1 billion. Yet the amount of foreign investment in 1984 alone consisted of nearly 20 percent of the total investment for the previous 22-year period.

The major foreign investor over the 1962 through 1983 period was Japan, which accounted for 49.5 percent of the total dollars. However, U.S. participation is increasing. The United States was the largest investor in South Korea in 1984, accounting for 45.6 percent of total investment dollars in that year.

To invest in South Korea, the foreign investor makes initial application to the Ministry of Finance (MOF), which directs the application to the relevant ministry for review. The MOF then directs the proposal to the Foreign Capital Inducement Deliberation Committee (FCIDC) and to the Foreign Capital Project Review Committee (FCPRC) for approval. If everything is in order, the MOF authorizes the project. The investor then applies to the relevant ministries for confirmation of specification of capital goods. Import declarations, as well as applications for exemptions or reductions of custom duties, are made to the customs office.

The investor then files a report of foreign capital inducement with the MOF and other relevant ministries, and registers all applications and approvals with the court system and the MOF.

LABOR FORCE PROFILE

The Economic Planning Board estimated that at the end of December 1984, the number of South Koreans 14 years and older stood at 27.79 million. The employable (economically active) population of Korea stood at 14.98 million, or 53.9 percent of the total. Unemployment steadily declined in 1984, an indicator of the growing economy. During 1982, 4.4 percent of the employable population were out of work. By 1984, unemployment had declined to 3.8 percent. Employment in the mining and manufacturing sectors is steadily increasing, while employment in the agro-forestry and fishery sectors is steadily decreasing.

Due to a comprehensive educational system, the South Korean literacy rate exceeds 97.5 percent. Furthermore, well-trained, highly qualified manpower is available in various fields due to a rapid increase in technical and vocational schools. An estimated 77,000 students graduated from college in 1983. Bilingual graduates are available in most fields.

Industrial Policy—South Korea

LABOR REGULATIONS

No minimum wage standards have been established by law in South Korea, although the Labor Standards Law authorizes the Director-General of the Ministry of Labor to set a minimum wage according to industry. Wages must be paid regularly and in full once or more per month, on a fixed day or days.

Large Korean companies adopt a paternal attitude toward employees, providing many nontaxable benefits such as transportation, lunches, housing at remote sites, or housing loans, as well as cash gifts for weddings and funerals. All employees are entitled to a physical examination when they begin working, and companies with 16 or more employees must pay for annual physicals as well.

The standard workweek is 48 hours--8 hours a day for 6 days. The working hours may be extended to 60 hours per week by mutual agreement, and an extended workweek has become a common practice in export manufacturing companies. Further extension of overtime hours requires previous approval of the Ministry of Labor. Eight hours of work a day are to be accompanied by at least one hour of rest. Anything beyond the standard workweek is considered overtime, and is subject to compensation at 150 percent of the standard hourly rate.

The industrial production workers' average monthly earnings and average number of workdays per month are shown in Table 7 in the South Korean section of "Demography and Economy."

INFRASTRUCTURE

Transportation

Highways

An extensive highway network for shipped goods already exists in South Korea, and all major cities are connected by paved roads. As of the end of 1983, total road mileage was 54,599 kilometers, of which 21,279 kilometers were paved. By 1986, 1,428 kilometers of expressways connected nearly every district in the country in a "one-day" travel network.

Railroads

All major urban areas are connected by railroad. As of the end of 1983, the total railroad mileage was 6,128 kilometers. The major ports of Pusan and Inchon are connected to Seoul by double track lines. Lines connecting Seoul with the mining districts in the eastern part of the nation have already been electrified. The subsidized railroad rate structure is extremely attractive for freight service.

Air Transportation

Seoul's Kimpo International Airport is served by 13 international carriers. In 1983, it handled 3.71 million international air passengers and 2.36 million domestic passengers. Domestic airline routes have expanded steadily to serve all major cities and industrial estates. At present, 16 major cities are connected to Seoul by daily service.

Marine Transportation

South Korea has a sizeable merchant fleet with a total gross tonnage of 7.83 million tons. The total cargo handled in the 24 open ports (including the ports of Pusan and Inchon) amounted to 147.7 million tons during 1983. Of this total, 89.9 million tons (61 percent) were import cargo and 29.3 million tons (20 percent) were export cargo. The remaining 28.5 million tons (19 percent) were domestic traffic among the coastal ports of Korea. Almost 99.8 percent of the total export and import cargo was moved by marine transportation.

Communications

Telephone installations increased to 5.33 million circuits in 1983, from 167,570 circuits in 1962. The first satellite station was built in 1970, followed by a second in 1976. These stations have greatly contributed to international communications with high-quality transpacific telegraph, telephone, and television connections from all member countries of the world. International communications will be much improved by the introduction of the automatic telephone system (3,000 lines). The satellite communication system added 470 lines by 1986.

Electric Power

Electricity is available in all industrial areas and towns. Installed capacity was 13,115 megawatts in 1983, and generation and transmission facilities are being expanded to meet the increasing demand for power for industrial use. Long-term electric power development programs called for an installed capacity of 18,081 megawatts by 1986.

Industrial Policy—South Korea

Industrial Estates

To keep pace with the rapid economic development, the government actively promotes the establishment of industrial estates. All the industries located in an industrial estate enjoy advantages such as low land costs, adequate power and water supplies, and good road networks. They also share various supporting facilities and special administrative support. Most important, however, are the tax concessions granted to foreign-invested enterprises under the Foreign Capital Inducement Act.

Foreign investors may either own or lease land throughout South Korea. Foreign nationals are subject to the regulations of the Alien Land Acquisition Law. This law requires that foreign-invested firms that hold over 50 percent of stocks or shares in a corporation obtain approval for land ownership from the Ministry of Home Affairs. Bonded warehouses and factories may be established at any point in the industrial estates with the approval of the Office of Customs Administration.

Free Export Zones

The Masan Free Export Zone was established in 1970 to encourage direct foreign investment and exports. In 1973, another free export zone was established near Iri. These two zones' special tax-free administrative areas have the characteristics of bonded areas. Various pertinent laws and regulations have been waived or relaxed altogether or in part.

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Industrial Policy--Taiwan

OVERVIEW

In 1952, manufacturing accounted for 18 percent of Taiwan's net domestic product (NDP), agriculture, 35.9 percent, and services, 46.1 percent. By 1984, the manufacturing share of the NDP rose to 50.6 percent, agriculture declined to 6.5 percent, and services to 42.9 percent. The average annual industrial production growth rate over the past three decades was 13.2 percent, while the economic growth rate averaged 3.7 percent.

These figures demonstrate that Taiwan's government emphasizes free enterprise and the growth of private industries. During the past 40 years, almost all development of new industries occurred in the private sector. In 1984, private sector industrial production accounted for 87.6 percent of the total industrial output, as compared with 43.4 percent in 1952.

In 1952, heavy industry accounted for 24.8 percent of the total value of manufacturing industry production; light industry accounted for 75.2 percent. In 1984, heavy industry production rose to 54.8 percent; light industry production was down to 45.2 percent.

The following sections give an overview of various aspects of Taiwan's industrial strategy.

History of Industrial Development

Industrial development in Taiwan during the past 40 years can be divided into five stages. From 1945 to 1950, emphasis was placed on rehabilitation and reconstruction of industries that were damaged during World War II.

This was followed by development of import-substitution industries aimed at production of consumer goods to satisfy domestic demand. This stage lasted from 1951 to 1960 and was the foundation for developing industries. From 1961 to 1970, effort was made to develop export-oriented industries. As a result, Taiwan was able to play an important role in the world market. Since 1971, local demand for raw materials has increased considerably due to rapid development of export industries. Thus the government considered it necessary to encourage capital-intensive heavy industries and petrochemical industries to produce raw materials and intermediates for local industries. This stage, therefore, may be termed as "the second era of import-substitution industrial development." Beginning in 1981, new factors affected industrial development. These factors include increasingly high-priced oil, keen competition among developing nations to sell light industrial products, and increasing protectionism by many developed countries. Consequently, future efforts will concentrate on development of strategic industries such as machinery and information industries. These industries will require less energy while exploiting high technology.

Taiwan's 1984 Industrial Performance

Taiwan's rapid industrial development over the past 40 years has created substantial changes in the nation's economy. It has turned the country from an agriculture-based to an industry-based economy.

According to the statistics compiled by the Ministry of Economic Affairs, the industrial production index (1981 = 100) increased by 14.1 percent in 1983 and by 12.4 percent in 1984. The industrial production increase of 22.69 percent in the first quarter of 1984 leveled off to 8.9 percent in the last quarter, partly due to statistical bias arising from the accelerating quarterly growth rate recorded in 1983.

Manufacturing increased by 13.1 percent due to an upsurge in export growth, especially in the field of electronic machinery and apparatus. Mining decreased by 2.9 percent, largely due to accidents and subsequent restrictions imposed on some coal mining pits. Construction of buildings increased by 8.7 percent, in spite of continued sluggish demand. Public utilities (water, electricity, and gas) increased by 7.1 percent due to a strong economic upswing.

With government promotion of efforts made by private enterprises for the development of strategic industries, the machinery industry enjoyed a growth in 1984 of 10.48 percent over the previous year. Machinery equipment exports increased by 18.4 percent to US$1,143 million. The exported machinery equipment was mainly conventional machine tools and sewing machines; but exports of DIY and CNC machine tools and turnkey plants are being developed. The machinery industry tends to produce combined mechanical and electronic precision machine tools and high-quality automatic production equipment. These tools are required by specific industries but tend to upgrade the whole manufacturing industry.

Taiwan Machinery Manufacturing Corporation cooperates with a number of foreign companies to produce heavy diesel engines. In addition, China Shipbuilding Corporation produces high pressure boilers, heat exchangers, cranes, steel structures, and machines for ships. The Taiwanese government also promotes the design and manufacture of complete sets of plant machinery and equipment. This scheme includes chemical and processing plants, either as a turnkey job or on a cost-plus basis, by both manufacturing and engineering firms.

Industrial Policy—Taiwan

Currently, Taiwan has about 20,000 traditional industrial factories of various sizes. Their main products include textile machinery, chemical machinery, plastic or rubber processing machinery, paper and printing machinery, freezers, food machinery, agricultural machinery, woodworking machinery, pump and water supply machinery, construction and mining machinery, casting machinery and products, rolling mill machinery and rolling mill products, building materials, home appliances, and office machinery.

Future low-technology products will include precision machine tools, precision tools, measuring instruments, gauges, moulds and dies, precision machine parts, etc.

Taiwan's electrical industry has a 30-year history. It evolved from the repair of electrical products to the manufacture of low-voltage equipment. It now produces heavy-duty electrical equipment. To fully develop the industry in Taiwan, the government has offered various incentives and budgeted funds to establish high-power testing facilities. Taiwan hopes to speed up the development of heavy electric machinery and to promote exports. In the meantime, the Electric and Electronic Products Development Association was established with government help to create internationally acceptable marks for electrical and electronic products. The famous Japanese test organizations JET and JMI have been invited to help set up this product authentication system.

Electrical product exports in 1984 amounted to US$1.4 billion, up 30.7 percent over the previous year. Electrical machinery and equipment accounted for US$650 million of the exports, and electrical appliances for US$750 million. Major export items include motors, switches, bare copper wire, power lines, electric fans, home appliance parts, and electric heaters.

The electronics industry in Taiwan has turned gradually from labor-intensive to high-technology- and capital-intensive. Currently, large investments are being made in information industries. In addition to the Statute for Encouragement of Investment and the related incentive measures enacted by the government, laws for intellectual property rights and copyrights are being worked out.

The total export value of electronics in 1984 amounted to US$5,165 million, up 42.4 percent over 1983. Of this amount, information industry products accounted for 19.8 percent as compared with 5.2 percent in 1982.

Petrochemicals produced in Taiwan can satisfy domestic needs. Now there are four naphtha cracking units, one ethane cracking unit, and two xylene separation units. These units produce 953,000 MT of ethylene, 457,000 MT of propylene, 130,000 MT of butadiene, and 730,000 MT of aromatic hydrocarbon.

Industrial Policy--Taiwan

Taiwan's economy is oriented toward foreign trade. Therefore, the raw materials and intermediates that are produced by midstream and upstream petrochemical industries in Taiwan are sold at prevailing international price levels to downstream processing industries. This maintains the export competitiveness of such products as plastics, textiles, and rubber. Taiwan's downstream processing industries have priority to use these domestically produced petrochemicals and thus balance production and demand.

Textile exports by value amounted to US$6,145 million in 1984, up 23.2 percent over 1983. Taiwan's textile exports have been limited by quotas imposed by industrialized countries and simultaneously confronted with keen competition from newly industrialized countries. Therefore, Taiwan's mid- and low-grade textile products have gradually lost their competitiveness in the international marketplace.

In view of this situation, the Taiwanese government has actively urged textile manufacturers to invest in research and development, to improve quality, and to raise the value of its products. In 1984, an ad hoc committee was formed to provide technical and managerial assistance to the textile industry. The committee sought to establish better management systems and to standardize operations in order to improve production and quality, reduce costs, and increase competitiveness.

Future Development

Accelerated industrialization during the past 40 years has led to considerable growth in Taiwan's production and trade. Plans are under way to further develop several types of industry: heavy, chemical, sophisticated, precision and strategic.

This development will provide sufficient quantities of essential raw materials for related downstream industries, and provide opportunities for investment in various industries by both local and foreign enterprises. At the same time, increased emphasis on heavy and sophisticated industries will improve the economic structure of the nation.

Dataquest expects a rapid increase in Taiwanese wages, thereby increasing foreign competition from labor-rich, low-wage developing countries. In response, efforts will be made to automate production, including investment in technology and management. Special efforts will be made to conserve energy and thus increase the industrial productivity.

Industrial Policy—Taiwan

Capital, technology, talent, and even the products of large international companies will be introduced into Taiwan. This should help internationalize industry there and make the country a major link in the world economy.

In the early stages of industrialization, nations provide appropriate protection to newly established industries to promote growth. But protectionism has not usually stimulated the most effective use of a country's resources. Japan showed that free transfer of capital, technology, and labor was the main reason that its economic growth after the first oil crisis was higher than that of Western countries. Therefore, Taiwan will gradually reduce protection given to its well-established industries. A more liberalized economy will be created so that the future industrial development will be stronger and healthier.

Summary

At present, Taiwan is the world's eleventh largest exporting country and the largest exporter of manufactured goods in the developing world. Products are made by 60,000 companies located in each county and city of Taiwan. Thousands of international buyers visit Taiwan every year to purchase items for their home markets.

Taiwan has an enormous potential for further industrial development. Its strategic position makes the island an ideal export base from which manufacturers can ship their products to countries around the world. Meanwhile, Taiwan's market of 19 million people not only serves as a testing ground prior to the export of new products, but also absorbs a portion of the output as well.

More important, after 40 years of development, Taiwan has built up a strong economic infrastructure with a wide range of supporting industries. This has set the stage for Taiwan to establish more sophisticated industries.

During the 1950s, Taiwan promoted the development of import-substitute industries such as textiles, plastics, plywood, and other wood products. The 1960s saw a rapid growth of these labor-intensive industries. Also developed during this period were consumer electronics, motorcycles, and hand tools.

In the 1970s, the increasing demand for components, raw materials, and better technology made possible the efficient operation of industries such as steel and petrochemicals. Taiwan's industrial base is now well developed. Since 1980, the government and private industry have moved rapidly to develop technology-intensive industries.

Industrial Policy--Taiwan

Electronic products are Taiwan's largest export item, making the country the world's eighth-largest electronics supplier. This category includes consumer electronic products, as well as such parts and components as ICs, transistors, capacitors, transformers, and memory boards. The Taiwanese government has targeted commercial and industrial electronic products for priority development in the 1980s.

Supported by a well-developed electronics industry, Taiwan's computer industry has grown substantially. Products such as microcomputers, CRT terminals, disk drives, and other peripherals are being rapidly developed. The 1980s have also seen a move into computer systems and software packages.

Taiwan has made significant developments in electronics and computers, but in each there is still room for growth.

INDUSTRIAL DEVELOPMENT STRATEGY

To promote the growth of Taiwan's economy, its government has promoted activity in several sectors. These activities are described below.

Development of Strategic Industries

In August 1982, the Taiwanese government selected 145 traditional and electronic items as strategic products to be developed. In September 1984, the list of strategic products was revised for the third time and increased to 171 items. Through the joint efforts of governmental agencies and private enterprise, strategic industries at large grew by 15.7 percent in 1984. Of this amount, the electronics grew 21.4 percent; traditional manufacturing, 10.5 percent.

According to statistics, the export value of electric and electronic products exceeded that of industrial products in 1984 and replaced textiles as the number one export. Among these export products, computers and peripheral equipment grew the fastest. These statistics show that considerable progress has been made in moving the industrial structure toward high technology. To step up development of the strategic industries, the government will coordinate and encourage manufacturer cooperation in developing future products.

Industrial Policy—Taiwan

Improved Competitiveness of Traditional Manufacturing Industries

Traditional manufacturing products have been the bulk of past exports. Recently efforts have been made to improve manufacturing productivity and product quality and to promote automation. In 1984, 10 task groups were organized to provide technical and managerial assistance to such activities as cotton spinning, weaving, dyeing and finishing, and to producers of garments, shoes, food, wood products, toys, rubber, and plastics. These task groups visited factories and presented recommendations on improving production line, quality control, material control, and working conditions. Their efforts increased productivity and competitiveness, as measured by production rationalization, a statistical method used to measure productivity.

Central Firm and Satellite Factories System

To improve the industrial system, efforts were made in 1983 to establish a system of central firms with satellite factories. This system stresses cooperation and esprit de corps so that a central firm can provide technical assistance to its satellite factories. This assistance improves satellite production and management and raises product quality. By the end of 1984, 25 systems had been set up in automobiles, electrical equipment, plastics, and other industries. Another 524 factories had been approved and registered to form the system. To improve the quality of materials, semifinished products, accessories, and finished products in this system, the Materials Research Laboratories of the Industrial Technology Research Institute were established. The laboratories provide an inspection service center to help the manufacturers both in the firm and in satellite factories.

New Product Development by Private Enterprise

The Taiwanese government has sought to reduce the risks involved in research and development so that private enterprise would be encouraged to undertake R&D. In September 1983, the Ministry of Economic Affairs implemented measures to encourage new product development by private enterprise. By the end of 1984, 10 new items had been developed: ICs for television manufacturing, 24-pin impact-type dot matrix printers, personal computer regional networks, closed hard disk drives, 16-bit computer packaged software, computer NC drilling machines, Mitac computers and design stations, Hantung 560 workstations, Multitech Chinese character operating systems, and bromide combustion preventive agents.

Industrial Policy--Taiwan

Product Design and Engineering

To improve the image of Taiwanese products and to prevent product counterfeiting, the Product Design Center (at the Union Chemical Research Laboratory of the Industrial Technology Research Institute) has taken measures to aid private enterprise in product design and engineering. Product design demonstrations for telephones, machine tools, personal computers, and toys have been made by concerned industry associations and manufacturers. This raises hopes that industrial standardization will be realized through the product design process so that spare parts of the same specifications made by various factories will be interchangeable.

Standardization of Manufacturing Parts and Components

Because machinery is the backbone of industrial development, a standardization plan for mechanical parts and components has been worked out jointly by the Industrial Development Bureau, the Mechanical Industry Research Laboratories (of the Industrial Technology Research Institute), the Metal Industries Development Center, and the Taiwan Machinery Association. This plan was implemented in four stages over three years, beginning in 1984. In the first and second stages, the parts and components of machine tools were completed. In the third and fourth stages, machinery and equipment for various industries will be completed. By the end of 1984, about 20 kinds of general-purpose parts and components had been standardized, including screws, nuts, pins, keys, springs, hydraulic components, bearings, and seals. Now these parts and components are being used on a trial basis by tool factories. In the meantime, selected factories are preparing for mass production of these parts in their specialized fields. This should reduce the cost of machine tools production and improve their competitiveness in foreign markets.

Quality Improvement of Export Products

The Industrial Development Bureau has commissioned the Chinese Precision Machinery Development Association (CMD) to help machine tool manufacturers increase their inspection skills and improve product quality. The Bureau has also requested that the Japan Precision Electronics and Machinery Inspection Institute (JM) send experts to Taiwan. The experts help the manufacturers make across-the-board inspections and tests on such products as lathes, millers, drills, grinders, and center cutters. To create inspection marks for export of plastic products, the Plastics Development Association of the Republic of China was set up in September 1984. Joined by 15 manufacturers, the association sought cooperation with Japanese inspection organizations and invited Japanese experts to Taiwan to offer technical expertise. At the same time, technicians will be sent to Japan to receive training in inspection skills and inspection management systems.

Additionally, Taiwan established the Electric and Electronic Development Association. Japanese inspection organizations such as JET and JM have been invited to help create inspection and test systems. The Industrial Development Bureau also helped the Taiwan Toys Association set up a toy safety inspection center. The center will issue "ST" marks to the toys that meet the national safety standards and that pass toy safety inspection.

Foreign Investment

By 1984, overseas investment in Taiwan amounted to US$4.5 billion. The benefits from foreign investments are mutual. Foreign companies that invest in Taiwan have been given significant cooperation by the Taiwanese government and people. As a result, these companies have earned profits from their operations, giving the island a good reputation for profitable offshore investments.

In the past, overseas investors were attracted to Taiwan mainly by its low-cost and diligent labor force. But after 30 years of development, Taiwan today offers much more: highly trained technicians, a strong industrial base with many supporting industries, and a well-developed infrastructure.

The government provides a wide range of incentives to encourage investments from abroad. The following are a few examples of privileges and protections for foreign investors:

- Foreign investments are accorded the same incentives and privileges as domestic investments by Chinese nationals.
- Foreign investors may own 100 percent of the enterprises in which they invest.
- All net profits and interest earnings can be converted and remitted.
- Foreign investors may, after one year in business, apply for repatriation of 100 percent of the invested capital.

- Foreign investors are protected against government expropriation or requisition for 20 years if the foreign investment in an enterprise is 45 percent or more of the total registered capital.

- Patents, trademarks, and copyrights are protected, and the restriction governing patentable new inventions is liberalized as a measure to encourage innovations and investment.

In addition to the foregoing privileges and protections, the government also provides general tax incentives to overseas investors. Major incentives in the Statute for Encouragement of Investment include:

- A five-year business income-tax holiday that can be deferred up to four years to increase its attractiveness for newly established capital- or technology-intensive projects

- Maximum income tax liability of 22 percent following the tax holiday

- Exemption from tariffs on machinery imports

- Exemption of business tax on export sales

- Tax breaks and other incentives to encourage quality control, research and development, pollution control, and energy conservation

INFRASTRUCTURE

Transportation and Utilities

In addition to generous tax incentives and a good potential market, Taiwan also offers overseas investors other attractions:

- A modern infrastructure and utility system

- Well-developed industrial districts

- Export processing zones

- Science-based industrial parks

- An adequate supply of labor at reasonable cost

Industrial Policy--Taiwan

An extensive network of highways, railroads, and air routes provides access to practically every corner of the island. Many recently completed projects have helped to relieve the transportation bottlenecks that resulted from rapid industrialization. The completion of other projects will further boost industrial development by making transportation faster and more efficient.

Taiwan has five international seaports: Keelung in the north, Taichung in the west, Kaohsiung in the south, and Suao and Hualien on the east coast. All of them are equipped with modern facilities. About 181 million tons of cargo a year pass through these harbors. Dataquest expects this figure to increase to 300 million tons a year by the end of this decade. Kaohsiung, the fifth largest seaport in the world, has become one of the most important container transshipment centers in Asia.

There are two international airports: one near Taipei at Taoyuan in the north and the other in Kaohsiung in the south. The Chiang Kai-shek International Airport at Taoyuan can handle 42 landings and takeoffs per hour. In addition to these two airports, many smaller airports link all the island's large cities and offshore islands.

Water and electricity are available virtually everywhere in Taiwan. Electricity rates and oil prices are very reasonable compared to other nations in Asia.

To facilitate industrial investment and operation, the government has developed 58 industrial districts. These districts have easy access to railroads and highways and feature intradistrict roads, waterworks, drainage and sewage systems, and power substations. Land in industrial districts is sold to investors at reasonable prices.

Export Processing Zones (EPZs)

To facilitate export-oriented industrial production, the government has established three export processing zones (EPZs). EPZs are a combination of free ports and industrial parks, complete with all necessary facilities. These facilities include standard factory buildings and relevant administrative, banking, and shipping support. The Kaohsiung and Taichung Export Processing Zones were fully occupied by the end of 1980. The Nantze Export Processing Zone, the newest and largest of these zones, still has space to accommodate new investment. The EPZs provide a favored investment alternative for many foreign investors.

Industrial Policy--Taiwan

Industrial Parks

Taiwan's future economic growth depends heavily upon its ability to raise the level of its technology. To meet this challenge, the government has set up the Science-based Industrial Park at Hsinchu, about 75 kilometers south of Taipei, where several academic and research institutions of science and technology are located.

Only technology-intensive industries are welcome in the park. First-stage development has been completed in an area covering 210 hectares. The park has intrapark roads, utilities, standard factory buildings, and residential units. It also operates as a bonded, duty-free area with a computerized inventory control system. Eventually, the park will cover 2,100 hectares.

Special incentives are available to qualified investors, including duty-free import of sophisticated machinery and raw materials used to make export products, further tax incentives, rental of land and buildings to reduce capital expenditures, and modern communications facilities, including real-time computer access to data banks in Taiwan and the United States.

Thirty-one companies have been approved to set up factories in the park. They will make minicomputers, integrated circuits, laser optics, precision instruments, silicon wafers, microcomputer systems, electronics, telecommunications, and other high-technology items. Many other applications from overseas investors are being processed by the park administration.

Service Centers for Foreign Investors

The Industrial Development & Investment Center (IDIC) and its sister organization, the Joint Industrial Investment Service Center (JIISC), were set up by the Ministry of Economic Affairs to render better and faster service to investors.

The IDIC works to make foreign-invested operations in Taiwan efficient and profitable. From the center, a potential investor can obtain information about investment opportunities, incentives, and regulations. The IDIC is also willing to help investors with the procedural formalities required to make an investment, to set up contacts with local suppliers, or to locate land for factories.

The JIISC is a new organization established to strengthen IDIC's services. An investor can enjoy "one-stop service" at the JIISC. It has placed under one roof all investment-related services, ranging from applications for investment approval, purchase of land, settlement of tax and foreign exchange, and import of equipment, to the establishment of factories.

Services offered by the IDIC and JIISC continue after an investor's factory is established. Staff members also act as troubleshooters for investors who already have projects in operation in Taiwan. Any procedural problems encountered by investors will be dealt with by officials at either of the two centers.

Foreign Investment Statute

Since the Foreign Investment Statute was enacted in 1960, the annual inflow of foreign and overseas Chinese capital has risen sharply--from US$15 million in 1960 to a record of US$559 million in 1984, though there was a temporary decline during the worldwide recession in the mid-1970s. A substantial portion of the annual investment approvals are from reinvestment of retained earnings, an indication of investors' satisfaction with their existing investments.

Though foreign-invested firms account for only a small portion of total national output, they produce a significant proportion of the nation's total export volume. They also play an important role in the export industries in which they are concentrated. Typical export products are electronics and petrochemicals.

Commercial and Industrial Trade Organizations

Taiwan has numerous industrial and commercial trade organizations. Some of them develop industrial lines while others coordinate efforts to develop the import-export business. In the past, most of these trade organizations have played a fairly limited role. A recent government decision to expand their role has, however, motivated these groups to take a more aggressive approach.

Top government officials have turned over some of their administrative work (such as inspection, job training, and market surveys) to trade organizations. At the same time, trade organizations have been encouraged to strengthen their role as liaisons between the government and private business. The Chinese National Federation of Industries, for example, has regular meetings with relevant government agencies on customs duties, tax rebates, and port operations. The following are Taiwan's major industrial and commercial organizations. At the end of the section is information about the Trade Mart in Taipei.

Industrial Policy--Taiwan

Chinese National Association of Industry and Commerce (CNAIC)

CNAIC was established by leading Chinese industrialists and businessmen in 1952 in order to improve communication between domestic and foreign businessmen and to further Taiwan's commercial and industrial development. As of July 31, 1985, CNAIC had 1,154 individual and 352 corporate members, operating under 31 directors and 11 supervisors.

A major CNAIC function is to study national economic policies, investment, and taxation laws and regulations. It also arranges trade fairs and exhibitions of Chinese products at home and abroad, and sends missions overseas to promote foreign trade.

CNAIC has taken a very active role in international trade activities. It is an organizing member of the Confederation of Asian Chambers of Commerce and Industry (CACCI), which opened its general secretariat in Taiwan in 1981. CNAIC's address is 17th Fl., 30 Chungking S. Rd., Sec. 1, Taipei, Taiwan.

Chinese National Federation of Industries (CNFI)

CNFI is a nonprofit organization established under the Industrial Organization Law to represent all the industrial organizations in Taiwan. At present, CNFI comprises 127 industrial associations in various lines of manufacture. Altogether, these associations represent more than 38,000 industrial enterprises.

CNFI provides detailed information about Taiwan's industrial development to businessmen and government agencies all over the world. It also serves as a liaison between local private industries and the government. Furthermore, it studies problems and coordinates efforts in energy, environmental control, industrial planning, and manpower utilization.

CNFI, which also promotes advanced technologies in Taiwan and improves the productivity of local industries, is located at 17th Fl., 30 Chungking S. Rd., Sec. 1, Taipei, Taiwan.

China External Trade Development Council (CETDC)

CETDC, a nonprofit organization, was established in July 1970 to promote sales of commodities made in Taiwan and to develop two-way trade. Operating with the full support of both the business community and the government, CETDC is Taiwan's largest and most active trade promotion organization.

CETDC's major activities are to survey overseas markets; to collect, compile, and disseminate trade information; to explore trade opportunities and introduce trade partners; to receive visiting traders and assist them in establishing relations with local businessmen; to organize trade missions and participate in international trade fairs; to sponsor shows of Taiwanese products in Taipei and in major cities overseas; and to provide assistance in procuring raw materials and capital goods from abroad.

Each year, CETDC stages more than 30 trade shows at home and abroad to promote Taiwan-made products. Among them are the Taiwan Toy and Gift Show, the Taiwan Building Materials and Hardware Show, and the Taiwan Electronics Show. CETDC also assists foreign organizations and companies to stage trade shows in Taiwan.

Trade publications put out by CETDC include the English-language Exports of the Republic of China and the monthly magazine, Taiwan Products, which is printed in English, French, Spanish, German, Japanese, and Arabic.

CETDC maintains an export product display center in Taipei, where a wide range of Taiwan-made goods are shown to foreign buyers. It also provides an export mart with various services where business deals can be concluded on the spot.

Its headquarters are 9-10th Floors, 201 Tunhua North Road, Taipei, Taiwan.

Euro-Asia Trade Organization (EATO)

EATO, founded in November 1975, is a nonprofit, private organization supported by business, financial, and industrial sectors. EATO promotes trade relations and improves the trade climate between Taiwan and Europe. It provides a wide range of free services for the development of Taiwan's trade with Europe. Its primary functions are to:

- Initiate contacts and establish working relationships with trade promotion organizations, chambers of commerce, federations of industries and other relevant agencies in European countries

- Assist European manufacturers, exporters, and importers in finding sales outlets and suppliers in Taiwan

- Assist local manufacturers, exporters, and importers in developing business contacts in European countries

- Arrange or sponsor visits to Taiwan for business leaders, journalists, and trade or industrial missions of European countries

- Collect and disseminate trade information on European countries to local businessmen and vice versa

EATO's address is 14th Fl., 1 Hsu Chow Road, Taipei, Taiwan.

Importers and Exporters Association of Taipei (IEAT)

IEAT was founded in 1947 with an original membership of 280. Today, its membership exceeds 7,000. IEAT has influenced and contributed to the growth of Taiwan's foreign trade as well as to its economic development.

IEAT's main function is to unite local traders and to coordinate their efforts in promoting Taiwan's two-way trade with nations all over the world. Within the association, 42 subcommittees provide services to the import and export trade of individual industries. An information center and a library at the head office also provide member companies with reference books and the most up-to-date market information.

IEAT publishes two business periodicals: Taiwan International Trade in English and Trade Weekly in Chinese. Trade Weekly disseminates trade information among member companies. Taiwan International Trade, on the other hand, provides overseas readers with complete and comprehensive information on Taiwan's supply market. Overseas distribution includes large trading companies, major trade organizations, importers, department stores, and other buyers around the world.

IEAT is located at 3rd Fl., 65 Nanking E. Rd., Sec. 3, Taipei, Taiwan.

Taiwan Importers and Exporters Association (TIEA)

TIEA was established in 1953. It comprises 20 importer and exporter associations in Keelung, Taichung, Chiayi, Hsinchu, and Tainan Cities; and Taipei, Taoyuan, Hsinchu, Miaoli, Taichung, Changhua, Nantou, Yunlin, Pingtung, Ilan, Hualien, Taitung, Chiayi, Tainan, and Kaohsiung Hsiens (Counties). Individual members of these affiliated associations total about 1,600.

The association assists members in investigating, analyzing, and developing international markets. Major activities include organizing trade missions and trade exhibitions and compiling trade information. The association also maintains a good library, serving members with valuable reference books and trade directories.

Three times a month, the association publishes Taiwan Traders Information. This Chinese-language publication disseminates trade news, market information, and overseas trade inquiries among members of the association.

Taiwan Importers and Exporters Association is located at 14th Fl., 2 Fu Hsing N. Rd., Taipei, Taiwan.

Taipei World Trade Center

The Trade Mart in the Exhibition Hall of the Taipei World Trade Center offers an overview of the highest-quality goods made by Taiwan's leading suppliers. The 3,000 exhibitors are exporters who were selected on a proportional basis to represent each industry in Taiwan. About 1,000 of these firms are represented in staffed showrooms, while another 2,000 occupy display stalls. Their exhibits are constantly updated to reflect the latest technological advances and trends.

All showrooms and display stalls are arranged by product categories, allowing buyers to contact as many suppliers as they need in the shortest possible time. A computerized management system covers details of all operations.

The 163,000 square meters of floor space in the Trade Mart make it Asia's largest and most comprehensive permanent trade display facility. With its many opportunities to compare quality and price under one roof, the Trade Mart provides a convenient business environment for international buyers.

The more than 70 staff specialists stationed in the Trade Mart speak English, Japanese, French, Spanish, and German. They assist with interpretation, arranging business meetings, and finding trading partners. A free shuttle bus runs between the CETDC headquarters and the exhibition site. Communication facilities are also available, including telephone, telex, typewriter, telefax, and copiers. A modern cafeteria and a snack bar are provided. The whole building is air-conditioned and each floor is linked within the central atrium by 26 escalators and three glass-sided elevators.

LABOR REGULATIONS

Taiwan's comprehensive system of legislation governs working conditions, hours, wages, unionization, collective bargaining, settlement of labor disputes, labor insurance, and labor welfare. Important labor regulation laws are summarized below.

Industrial Policy--Taiwan

Work Hours

The Labor Standards Law (enacted in July 1984, and applicable to most industries) specifies that regular work hours cannot exceed 8 hours a day and 48 hours a week. If overtime is necessary, the employer may extend the regular work hours. However, overtime cannot exceed 46 hours a month for male workers and 32 hours for female workers. Children cannot work more than eight hours a day, or on ordinary holidays, or between 8 p.m. and 6 a.m. except under prescribed conditions and with special approval.

For two or less hours of overtime, workers are paid a premium of at least one-third of their regular hourly wages. For additional overtime, workers are paid a premium of at least two-thirds of their regular hourly wages.

Vacations and Holidays

Workers governed under the Labor Standards Law are given at least one rest day every seven days. They are also granted leave on all national holidays, Labor Day, and other holidays announced by the government. In addition, workers who have been employed continuously by the same company for at least one year are entitled to special vacations ranging from 7 to 30 days depending on the total years of service.

Termination

Usually an employer must give an employee 10 days' advance notice of termination if the employee has worked consecutively for three months or more but less than one year; 20 days' notice if the employee has worked for one year or more but less than three years; and 30 days' notice if the employee has worked for three years or more.

The Labor Standards Law stipulates further that when workers have worked consecutively for a year in the same enterprise, they are entitled to a severance payment equivalent to one month's average wage for each year of service.

Labor Insurance

Employers of five or more workers in certain industries must insure their employees between the ages of 14 and 60.

Labor insurance must provide maternity benefits for female workers and for the wives of insured male workers, hospitalization expenses for injured workers, benefit payments for injuries plus additional benefits in the event of disability, death benefits for both the insured and his family (including his parents), and retirement payments.

As of February 1979, labor insurance coverage now is of two types: ordinary risk insurance and occupational risk insurance. The premium for ordinary risk coverage is 7 percent of an employee's monthly salary or wage, 80 percent of which is borne by the employer. The premium for occupational risk insurance coverage is paid entirely by the employer.

Employees' Welfare Fund

The Statute for Employees' Welfare Fund stipulates that any business employing 50 or more workers is required to contribute funds for the employees' welfare. These funds are to be drawn from both company revenue and the employees' wages. For workers without permanent employers, a welfare fund is provided by the labor unions.

Retirement Payments

The Labor Standards Law stipulates that a worker who meets either of the following conditions may request retirement:

- Has worked for 15 years or more and reached 55 years of age.
- Has worked for 25 years or more.

Also, compulsory retirement cannot be enforced unless one of the following conditions exits:

- The worker has reached 60 years of age.
- The worker is unable to perform a job due to mental or physical disability.

An employer must contribute to the retirement fund, which cannot be transferred, attached, offset, or used as collateral. The rate of contribution is determined by the central government authority in charge and approved by the Executive Yuan.

Strikes

Although the Trade Union Act recognizes the basic right of labor to strike after mediation fails to settle a labor-management dispute, strikes are in fact prohibited by the National Mobilization Law. When labor disputes do occur, they are mediated by the arbitration committees organized in various counties and cities.

Industrial Policy--Hong Kong

OVERVIEW

Manufacturing is the mainstay of Hong Kong's economy, accounting for some 22 percent of the gross domestic product. Up to 90 percent of Hong Kong's manufacturing output is eventually exported. Light manufacturing industries, mostly producing consumer goods, predominate. About 67 percent of the total industrial work force is employed in the production of textiles, clothing, electronics, plastic products, toys, watches, and clocks. These industries together accounted for 80 percent of Hong Kong's total domestic exports in 1987, a pattern that is likely to continue.

However, Hong Kong's manufacturers have made considerable changes and improvements in the range of products. Many new and sophisticated product lines have been introduced. Other simpler product lines have been abandoned, partly because of competition from lower-cost producers within the region and partly in response to pressures to move up-market. These pressures have come in various forms of protectionism in some of Hong Kong's main markets. Hong Kong manufacturers have thus increasingly emphasized quality and technical excellence.

The following sections describe the Hong Kong government's strategy for supporting industrial development and attracting foreign industrial investment. There is also an introduction to Hong Kong's work force and industrial infrastructure.

INDUSTRIAL DEVELOPMENT STRATEGY

Industry Development Board

Hong Kong's Industry Development Board was established in 1983 to advise the government on industrial matters. The board also seeks to ensure an adequate infrastructure so that industry can function efficiently and profitably, and can achieve quality and technical excellence. The board, chaired by the financial secretary, includes representatives from the major industrial and trade organizations, leading industrialists, academics, and civil servants. Three committees and two subcommittees assist the board in its work. The General Development Committee considers the needs of industry through techno-economic and market research studies, and supervises industrial development projects. The Science and Technology Support Committee provides advice and technical information to industry. The Infrastructure and Support Services Committee considers all other issues relating to government creation of an infrastructure for industry. Two subcommittees under the Science and Technology Support Committee advise industry on the development of electronics technology, computer-aided design, and computer-aided manufacturing technology.

The government's Standards and Calibration Laboratory (created in September 1984) maintains local reference standards of measurement keyed to international standards. The laboratory also provides a calibration service, primarily to meet the needs of the electrical and electronics manufacturing sector. Hong Kong plans to expand this service to cover other fields.

Industrial Policy--Hong Kong

On the recommendation of the Industry Development Board, the Hong Kong Design Innovation Company, Ltd. (a private company) was formed with government financial assistance and incorporated in October 1985. This company offers local industry a product innovation and design service.

During 1985, the board formulated a three-year plan to implement various proposals for supporting industry. In addition, a techno-economic and marketing research study on the plastics industry began in April 1985. A research study on computer-aided design and manufacturing systems started in July 1985. The board also commissioned an in-depth study on the textiles and clothing industry. Three research projects on electronics technologies, undertaken by the two universities and Hong Kong Polytechnic, continued.

Industrial Investment Promotion

To strengthen industrial investment promotion activities, the Industry Department has established five overseas investment promotion offices—in New York, London, Tokyo, Stuttgart, and San Francisco. The offices have generated considerable interest in Hong Kong as a manufacturing base. Because the United States is by far the most important source of investment and inquiries, it has two investment promotion offices.

The Industry Department promotes the introduction into Hong Kong of new or improved production technology and processes. In this way, local industry can upgrade itself with higher technology and higher manufacturing skills. The department also helps local manufacturers to locate overseas partners willing to enter into licensing or other agreements. The Industrial Investment Promotion Division, through its "One Stop Unit" in Hong Kong and overseas offices in San Francisco, New York, London, Brussels, and Tokyo, helped attract HK$306.25 million worth of overseas investment into Hong Kong during the year, despite a fiercely competitive environment in which prospective investors are pressed by other parties in the region and by development authorities in their own country. These investments channel valuable new technology and expertise to Hong Kong. The Industrial Promotion Division responds to inquiries, follows through individual projects, and develops personal contacts with the public and private sectors. It also carries out a formal promotion program of outward missions, participation in trade fairs and seminars, and speaking engagements in North America, Europe, Australia, and East Asia.

Industrial Estates

Hong Kong has sought to accommodate high-technology industries that cannot operate in the ordinary multistory factory buildings that house the bulk of Hong Kong's manufacturing industry. Thus the government has made available 136 hectares of land at two industrial estates in the New Territories' new towns for leasing at a price that reflects site formation and servicing costs only. Projects that will introduce new or improved processing technology or products to Hong Kong are preferred in these estates.

The estates are constructed and managed by the Hong Kong Industrial Estates Corporation, an autonomous, nonprofit body established by law and funded by government loans. The estates are close to main urban areas, the airport, the harbor, and the container cargo terminal. A ready source of labor supply, an integral part of Hong Kong's new town developments, is ensured. Each estate is also fully serviced with roads, electricity, water, telephones, drains, and sewers.

More than 30 factories are already operating in the estates and others will begin production soon. These include Hong Kong and overseas companies and joint ventures between local and overseas investors. Products include integrated circuit chips, electronic and elec- trical equipment, heavy machinery, automobile parts, beverage cans, domestic appliances, and food products.

Apart from sites for built-to-order factories, ready-built standard factory units are also available to satisfy the needs of manufacturers who are anxious to begin production quickly. Hong Kong has no restriction on foreign purchase of land, so overseas investors can own their factories.

Foreign Investment

Despite the 1997 return of control to mainland China, Hong Kong continues to be an attractive location for overseas manufacturers. It does not need a tax incentive scheme like some neighboring countries to encourage foreign investment. Hong Kong has one of the world's lowest tax rates, a maximum 17.0-percent profits tax for all corporations. The following factors also contribute to the attractiveness of Hong Kong as a place for foreign investment:

- The government's consistent economic policies of free enterprise and free trade with minimum interference
- Competitive wages
- An industrious work force
- A sophisticated commercial and industrial infrastructure
- A modern and efficient seaport
- Excellent worldwide communications
- A lack of import tariffs and exchange controls
- Proximity to the potentially huge mainland China market

Industrial Policy--Hong Kong

As of March 1986, 577 manufacturing establishments were either fully or partly owned by overseas interests. (The total value of overseas investment equaled HK$15.5 billion.) These factories employed 97,126 workers, or 11.0 percent of total industrial employment in Hong Kong. The United States remains the largest source of overseas industrial investment in Hong Kong, accounting for 36.4 percent of the total value. Japan is second with 21.1 percent and China is third with about 18.4 percent. The principal industries involved are electronics, nonmetallic mineral products, and textiles and clothing.

INFRASTRUCTURE

Marine Transportation

A number of shipping companies provide regular service from Hong Kong to all parts of the world. In 1987, more than 15,170 ocean-going vessels and some 86,490 river trade vessels used the harbor, loading and unloading about 70 million tons of cargo. About 48 percent of Hong Kong's imports and exports are containerized. The Port of Hong Kong, in terms of containers handled, is the largest in Asia. It is also the world's third largest port, with an annual throughput of 3.4 million TEUs (twenty-foot equivalent units). Expansion of the existing container terminals will increase capacity to 3.0 million TEUs by 1990, and 3.7 million TEUs by 1992. Average turnaround time at the container terminals is thirteen hours.

Air Transportation

Hong Kong's Kai Tak International Airport is served by some 37 international airlines, providing about 1,200 weekly scheduled passenger services between Hong Kong and 77 other cities. About 30 percent of Hong Kong's exports leave by air. Nearly 12.7 million passengers and 611,000 tonnes of cargo pass through the airport each year.

Internal Transportation

Hong Kong's highway network is capable of coping with the heavy traffic generated by its industrial and commercial activities. Cross-harbor links between Kowloon and the Hong Kong Island are provided by ferry services, a subway, and a four-lane 0.9-mile Cross Harbor Tunnel. The electrified Kowloon-Canton Railway operates between Kowloon and the New Territories, terminating at the Chinese border. The railway is linked with the Mass Transit Railway (Hong Kong's subway) through an interchange station. The Mass Transit Railway operates 23.8 miles of railway, composed of three separate but interconnected lines. Currently, 1.8 million people travel daily on the subway. The total construction cost incurred by the railway is HK$21 billion (US$2.69 billion).

Industrial Policy--Hong Kong

Telecommunications

Hong Kong's telecommunication services are provided by two local companies: the Hong Kong Telephone Company, Ltd. (for internal communications), and Cable and Wireless (HK), Ltd. (for external telecommunications). Hong Kong Telephone, operating under a government franchise, is a subsidiary of Cable and Wireless Plc. and the Hong Kong Government.

Hong Kong's telephone system links more than 2.6 million telephones, meaning that there are about 46 telephones for every 100 people. International direct dialing to more than 180 countries is available.

The telex service provided by Cable and Wireless has more than 20,000 subscribers. High-speed data and facsimile services are also available. Telecommunication services are provided by a complex of systems: coaxial cables, satellite, tropospheric scatter, microwave, and HF and VHF radio. Satellite communication was first available in Hong Kong in 1969. There are now four 98-foot dish-shaped satellite antennas in Hong Kong.

Electricity

Hong Kong Island and the neighboring Lamma Island are supplied with electricity by the Hong Kong Electric Co., Ltd.; the remainder of the territory receives its supply from the China Light & Power Co., Ltd. Both companies are investor-owned and do not operate under franchise.

China Light and Power and the Hong Kong Electric Company have a total generating capacity of 3,600mW, which will increase to 6,000mW in 1990. Its transmission system operates at 400kV and 346 volts. The supply is 50Hz alternating current, at 200 volts single-phase or 346 volts three-phase. For large consumers, supply is also available at 132kV, 33kV, and 11kV.

The generating capacity of Hong Kong Electric is 2,400mW. The company's transmission system operates at 275kV, 132kV, and 66kV; distribution is mostly at 11kV and 346 volts. The supply is 50Hz alternating current, at 200 volts single phase or 346 volts three phase.

The transmission systems of the two electricity companies are connected. The China Light system is also connected with that of the Guangdong Power Company of mainland China.

By the 1990s, Hong Kong will need additional generating capacity. A 1,800mW nuclear power station is being planned in southern Guangdong that will supply power to both the Province and Hong Kong. A joint-venture company of Chinese and Hong Kong partners has been formed to own and operate this nuclear power station. China Light, a beneficial shareholder of the joint venture, will purchase 70 percent of the electricity generated by the nuclear plant.

LABOR FORCE PROFILE

The expanding role of high technology in manufacturing since the 1960s has increased the demand for engineers, technologists, technicians, and other skilled operatives. The Hong Kong government recognizes that continued economic growth depends heavily on an adequate supply of properly educated and trained manpower. It has therefore embarked upon a program to expand and improve technical education. This program includes further expansion of the universities and the polytechnics; provision for new technical institutes, industrial training centers, secondary technical and pre-vocational schools; and the establishment of the Vocational Training Council. The government has also implemented training plans for several key industries. Together with those returning from overseas studies, graduates of Hong Kong's learning institutions provide a steady supply of intelligent, adaptable, and qualified manpower.

Nine years of free and compulsory education are available for every Hong Kong child from Primary I to Form III in secondary school.

LABOR REGULATIONS

Hong Kong has no statutory minimum wage---its wage level is determined by supply and demand. Wages are usually calculated on a time basis such as hourly, daily or monthly, or on an incentive basis such as piece rate. Wages are customarily paid half-monthly for daily rated and piece-rated workers. Semiskilled and unskilled workers in the manufacturing industry are mostly piece-rated but daily rates of pay are common. Monthly rated industrial workers usually have higher skills. By local custom, many employers grant an extra month's pay to their employees at the end of the Lunar New Year.

Under Hong Kong's Employment Ordinance, every employee who has worked for the same employer under a continuous contract for more than four weeks is entitled to one rest day a week. An employee is also entitled to seven days' annual leave with pay after working 12 continuous months for one employer. All manual workers and those nonmanual workers earning not more than HK$10,500 per month are entitled to 11 statutory holidays a year. Women workers who have been employed under a continuous contract for not less than 40 weeks are entitled to 10 weeks paid maternity leave at two-thirds of their monthly or daily rate of pay. An average worker in an electronic factory earns approximately HK$2,000.00 monthly.

Industrial Policy--Singapore

Since 1979, the Singaporean government's industrial policy has been to restructure its economy to emphasize higher value-added, skill- and technology-intensive industries and services. The manufacture of export-oriented products is also encouraged because of the very limited domestic market opportunities. In particular, R&D in areas such as automation and robotics, microelectronics, information technology, biotechnology, chemicals and plastics, materials science, and precision engineering is being actively promoted.

This section discusses a number of tax and other incentives that encourage investment in preferred areas.

TAX INCENTIVES

Pioneer Industries

Pioneer industries are granted complete tax exemption on company profits for periods of from 5 to 10 years. Manufacturing and service enterprises may be given longer periods of tax exemption if they incorporate R&D as part of their operations. Industry projects are considered to be pioneer industries unless the products are already manufactured locally without incentives.

Expansion of Established Enterprise

Established businesses are granted partial tax exemption if their incomes from business expansion increase for a period of up to five years, and incur new capital investment of at least S$10 million (which equals US$4.8 million at S$2.09/US$1.00 throughout this section).

New Technology Incentive

Losses during a company's first three years of up to 50 percent of the equity invested can be written off against an eligible holding company's taxable income. To be eligible, a holding company must be incorporated and located in Singapore, at least 50 percent owned by Singapore citizens or permanent residents, and involved in an emerging technology project.

Foreign Loans for Capital Equipment

The interest received by nonresident lenders from repayment of an approved foreign loan is tax-exempt if the loan is at least S$200,000 (US$95,694) and used for the purchase of capital equipment. Another condition is that if lenders are nonresidents, relief from Singapore tax should not increase their tax liabilities in their countries of residence.

Industrial Policy--Singapore

Royalties, Fees, and Development Contributions

For royalties, fees, and development contributions, partial (i.e., 50 percent) or complete exemption from tax is permitted, depending on the circumstances and the discretion of the minister of Finance. As above, the other condition is that if recipients are nonresidents, the Singapore tax relief should not increase their tax liabilities in their countries of residence.

Investment Allowances

In addition to the normal capital allowances, an allowance of up to 50 percent of new investment in fixed machinery and factory buildings (excluding land) incurred by a corporation on an approved project is given as a deduction against chargeable income. Although there is no minimum investment requirement, the investment must be made within a stipulated qualifying period of not more than five years from the investment day. Furthermore, the related asset cannot be sold within the qualifying period or within two years thereafter without prior approval of the minister of Finance.

Warehousing and Service Incentives

One-half the profits from export sales or export services are tax-exempt for five years. The minimum investment for this exemption is S$2 million (US$956,900) in buildings and capital equipment that warehouse goods to be exported or that provide technical or engineering services wholly or primarily to persons who are not Singapore residents.

International Consulting Services

One-half the export income is tax-exempt for five years for companies that provide consulting services related to an approved overseas project in cases where the expected future annual revenue from the project will exceed S$1 million (US$478,500).

Research and Development

There are four main tax incentives to encourage investment in R&D:

- Double deduction of expenditure incurred by a manufacturer for an approved R&D project related to the manufacturer's trade or business (Payment made by a manufacturer to an R&D organization for any approved R&D project on the manufacturer's behalf will also qualify for double deduction.)

- Extension of the initial 25 percent allowance and annual 3 percent allowance (presently available only for industrial buildings and structures) to buildings used for R&D

- Accelerated depreciation allowances over three years given for expenditures incurred on plants and equipment used to provide R&D services for the manufacturing sector

- Depreciation allowances over a five years period for capital expenditures incurred by a manufacturer when acquiring approved expertise or patent rights.

Accelerated Depreciation Allowance

Accelerated depreciation allowances are allowed over three years for prescribed plant and equipment of an industrial enterprise and on any antipollution equipment. Data processing and office automation equipment can be written off completely against taxable income in the first year of purchase.

Concessionary Tax Rates

There are four income qualifiers for a 10 percent concessionary tax rate:

- The offshore income that an approved financial institution derives from the operation of its Asian currency unit (Asian currency is analogous to the Eurodollar.)

- The income of an approved member of the Singapore International Monetary Exchange derived from offshore gold transactions, or in any approved commodity of financial futures on any approved exchange

- The income that an insurance company derives from insuring and reinsuring offshore risk

- The income that operational headquarters in Singapore derive from providing management services to subsidiaries and/or associated companies abroad (Other income earned from abroad may be eligible for effective tax relief.)

Tax-Exemption on Certain Shipping Enterprises

Companies owning or operating seagoing Singapore-registered vessels deriving income from the carriage of passengers, mail, livestock, or goods or income from the charter of such ships are exempt from tax.

Export Promotion

Subject to certain conditions and restrictions, double deduction of expenditures is allowed to Singapore manufacturers participating in approved overseas trade fairs and exhibitions, and overseas trade missions.

Industrial Policy--Singapore

FINANCING SCHEMES FOR SMALL INDUSTRIES

In order to qualify for either of the financing schemes described in the following paragraphs, several conditions must be met. For example, loans are granted to establish new small enterprises, to modernize and automate plants and machinery, to expand existing production, to diversify into other product lines, and/or to provide working capital to existing viable projects in need of funds.

In addition, an eligible company must have a minimum of 30 percent local ownership and maximum staff size of 50 employees (for a service enterprise). It must be involved in manufacturing or related support or service activities, and have fixed assets (i.e., factory buildings, machinery, and equipment) not exceeding S$8 million (US$ 3.8 million).

For a small enterprise with fixed productive assets of up to S$3 million (US$1.4 million), the maximum loan is S$2 million (US$1 million). For enterprises with fixed productive assets exceeding S$3 million but less than S$8 million (US$ 3.8 million), an extra amount of as much as S$3 million may be granted. The interest rate for both schemes is generally 7.75 percent per annum.

Capital Assistance Scheme

The Capital Assistance Scheme is used to promote projects of strategic value to Singapore's industrial development. Such projects can obtain long-term, fixed rate loans at favorable interest rates, provided they are fully secured by prime bank guarantees.

Small Industries Finance Scheme

Launched in 1976, this loan scheme is to encourage further development and technical upgrading of small industry operations. By the end of 1986, 1,077 loans, amounting to S$250 million (US$120 thousand), were approved.

RESEARCH AND DEVELOPMENT ASSISTANCE SCHEME

The S$50 million (US$23.9 million) Research and Development Assistance Scheme fund provides financial assistance to major R&D projects of national importance and technological significance. Both private sector companies and public agencies can apply for funding, which covers up to 100 percent of approved direct project costs. The scheme focuses on infrastructure building, technical innovation, and training of the local research staff. Projects eligible for grants usually require one to five years to complete. No maximum limit is set on grant value.

PRODUCT DEVELOPMENT ASSISTANCE SCHEME

The Product Development Assistance Scheme is set up to develop local applied research and product development capability and to enhance indigenous technology. Its intent is to encourage local companies to develop new products and processes or improve existing ones.

Grants are for product or process development work carried out either in-house or through outside agencies. Where foreign consultants are engaged, the cost will be supported only if there is close collaboration with local engineers and scientists to effect technology transfer.

To be eligible, an applicant should be a Singapore company with majority shareholding by citizens or permanent residents of Singapore. The proposed development project should preferably be closely related to the applicant's existing manufacturing activities and should involve substantial technical improvements to the products or processes and not merely cosmetic changes in product design.

Under this scheme, grants are equal to 50 percent of the approved project's direct development costs, including labor, equipment, materials, consulting, and utilities. For grants exceeding S$50,000 (US$23,900), an external auditor's certification is required.

SKILLS DEVELOPMENT FUND

The Skills Development Fund (SDF), established in October 1979, upgrades the skills of the labor force and retrains retrenched and redundant workers by providing incentive grants to employers. The grants are financed by collections from the Skills Development Levy, which imposes a tax on employers equal to 1 percent of the salary of employees earning S$750 per month or less (US$359 per month). The fund is used to promote skills important to Singapore's economic restructuring efforts by providing the grants discussed below.

SDF Training Grants

SDF training grants provide employers with 30, 50, or 70 percent of the allowable costs of training their employees in advanced skills.

Development Consulting Scheme

The Development Consulting Scheme grants as much as S$250,000 (US$119,600), limited to 30, 50, or 70 percent of allowable costs, to local Singapore companies. This is to reduce the cost to a company of hiring an external expert for a short-term assignment aimed at establishing a business upgrading plan or a training program, or at imparting higher skills and technology.

Interest-Bearing Grants for Mechanization Scheme

Grants for mechanization allow companies to invest in machinery or equipment that achieves one or more of the following goals:

- Significant savings in labor costs
- Significant increases in labor productivity
- Introduction of more sophisticated or skilled operations

GUARANTEES AGAINST EXPROPRIATION AND NATIONALIZATION

Singapore has bilateral agreements with the governments of Belgium, Canada, China, France, Luxembourg, the Netherlands, Sri Lanka, Switzerland, the United Kingdom, the United States, and West Germany that protect investors against war, expropriation, and nationalization. Other arrangements, are available through the Crown Agents in the United Kingdom, and the Overseas Private Investment Corporation (OPIC) in the United States.

PATENT PROTECTION

Singapore currently has no provision for the grant of original patents. Trademarks can be protected by registration under the Trademarks Act.

COPYRIGHT PROTECTION

Singapore's new copyright law is to be enacted in the near future. The law, now being drafted, may incorporate longer periods of copyright protection for original works and stiffer penalties for offenders.

ECONOMIC DEVELOPMENT BOARD

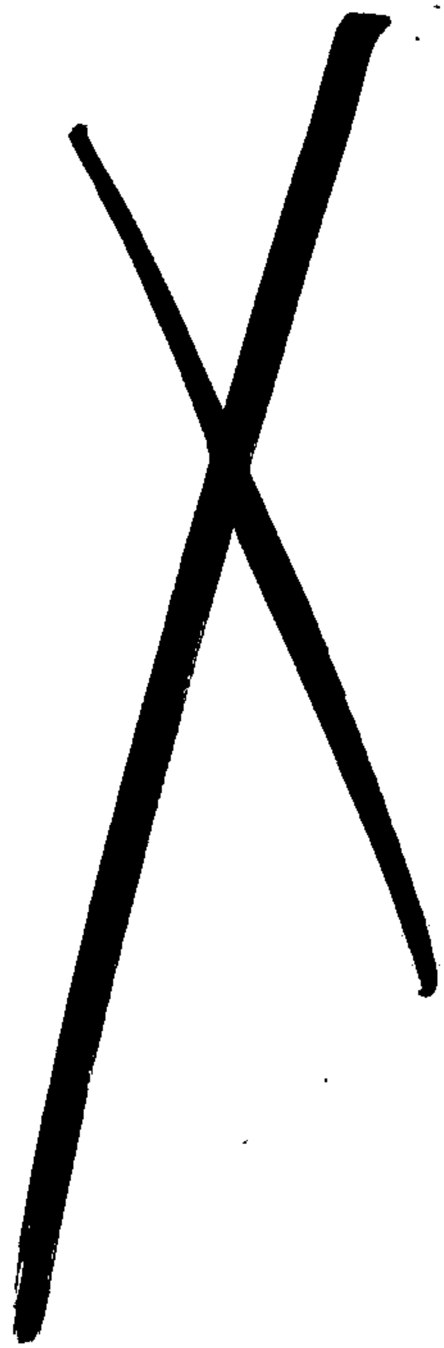
The Economic Development Board (EDB), a statutory board established in 1961, has aided Singapore's transformation from a trading nation into a modern, diversified economy. It is responsible for planning and promoting industrial investments and labor development in manufacturing and related service industries. Since 1986, it has also promoted the services sector, in partnership with other government agencies, and the development of local small and medium-size enterprises.

The EDB is concentrating on attracting investments in manufacturing and other high value-added services, where Singapore has a comparative advantage. It is actively encouraging companies to use Singapore as a "total business center" to design, produce, market, export, and service their products, and to manage their international operations.

In addition to handling inquiries and applications for tax and other incentives, the EDB assists investors in obtaining land and factory space, long-term financing, skilled labor, and other business services.

The EDB can be contacted at:

- Singapore Economic Development Board
  1 Maritime Square #10-40
  World Trade Center (Lobby D)
  Singapore 0409
  Telephone: 2710844
  Cable: INDUSPROMO
  Telex: RS 26233
  Fax: 2747035



Government R&D Projects--South Korea

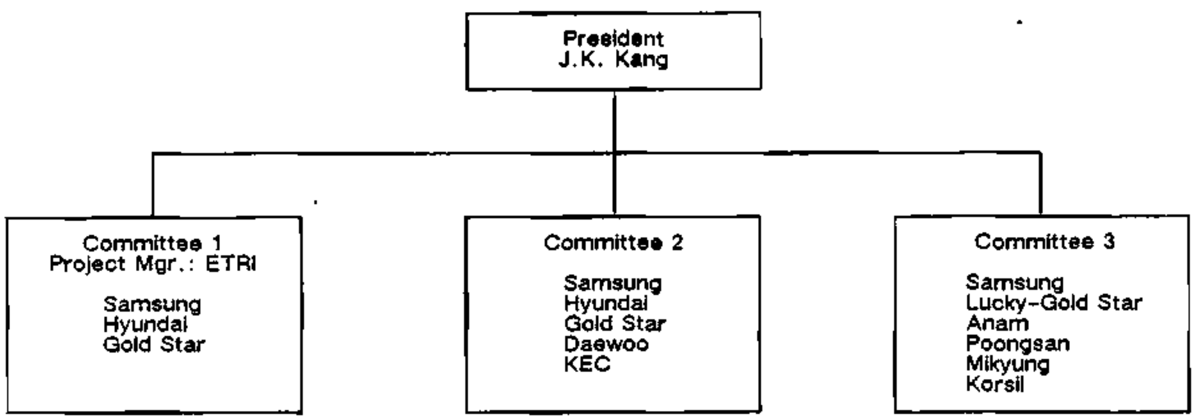
Initially, South Korea followed Japan's strategy, concentrating on commodity memory products such as 64K and 256K DRAMs. However, advanced product design know-how and the design engineering resources of the individual companies is limited. Therefore, Dataquest believes that manufacturing products beyond 1Mb DRAM will be quite difficult. The South Korean government recognized this problem and initiated a dialogue among South Korean semiconductor companies as early as the summer of 1985 to form a cooperative effort to produce advanced memory products. This effort began to materialize in the spring of 1986 with a formal cooperative project known as the Korean Semiconductor Cooperative Research Project (also known as the Korean VLSI Project).

THE KOREAN SEMICONDUCTOR COOPERATIVE RESEARCH PROJECT

The Project was formally launched on April 10, 1986, and its organization was announced immediately, as shown in Figure 1.

Figure 1

KOREAN VLSI PROJECT ORGANIZATION CHART



Source: Dataquest
March 1987

The presidency of the organization was assumed by Jin-Ku Kang, president of Samsung Semiconductor and Telecommunications Industries.

Project Committees

As shown in Figure 1, the Project comprises three committees, each of which has specific assigned projects.

Committee 1

- Project Manager: Semiconductor Group, Electronics and Telecommunications Research Institute
- Participants: Samsung Semiconductor and Telecommunications, Hyundai Electronics Industries, Gold Star Semiconductor
- Objectives: Develop 4Mb DRAM by 1989 and begin manufacturing in 1990. To implement this project, the following tasks should be accomplished:
  - Product design capability
  - Process development of 0.8-micron critical dimension utilizing a totally dry etch process
  - Product test capability

Committee 2

- Project Manager: Not assigned
- Participants: Samsung Semiconductor and Telecommunications, Hyundai Electronics Industries, Gold Star Semiconductor, Daewoo Telecommunications (Semiconductor), Korea Electronics Co. (KEC)
- Objective: Nonmemory-related IC projects:
  - Advance consumer IC products by 1989
  - Establish IC design automation technology, such as simulator, layout software, standard cell library, by 1991
  - Establish 1-micron ASIC technology by 1991

- Develop 32-bit and 64-bit microprocessors by 1991
- Develop industrial ICs, such as smart power devices, by 1989
- Develop ISDN ICs by 1991

Committee 3

- Project Manager: Not assigned
- Participants: Samsung Group, Lucky-Gold Star Group, Anam, Poongsan, Mikyung, Korsil
- Objective: Develop support industries
  - Establish ability to produce very high-purity silicon wafers by 1990
  - Produce compound semiconductors, GaAs, InP, and others by 1991
  - Produce chemicals, specialty gases by 1991
  - Qualify lead-frame material PMC 102 by 1988
  - Develop and manufacture bonding wire by 1989
  - Produce certain packaging equipment by 1989

Project Funding

The Korean VLSI Project funding is to be shared equally by government and industry. However, the industry portion will be heavily subsidized by government-guaranteed, low interest loans. Table 1 shows the project funding allocated through 1988.

Table 1

KOREAN VLSI PROJECT FUNDING

	Year		Billions of Won	Millions of U.S. Dollars*
Committee 1	1986		W 16.3	$ 18.9
	1987		26.6	30.9
	1988		26.9	31.3
		Total	W 69.8	$ 81.1
Committee 2	1986		W 5.4	$ 6.3
	1987		5.6	6.5
	1988		6.3	7.3
		Total	W 17.3	$ 20.1
Committee 3	1986		W 3.4	$ 3.9
	1987		6.3	7.3
	1988		8.0	9.3
		Total	W 17.7	$ 20.5
		Total Project Fund	W 104.8	$121.7

*Exchange rate W860/US$1

Source: Dataquest
March 1987

Government R&D--Taiwan

GOVERNMENT STRATEGY

Taiwan's economic authorities have developed a plan for strategic industries that offers incentives to producers of certain products considered important to the economic development and defense of Taiwan. In January 1984, the Development Fund of the Executive Yuan and the Bank of Communications jointly appropriated NT$20 billion (US$500 million) to continue financing the development of strategic industries through low-interest, medium- and long-term loans. A similar fund of NT$10 billion (US$250 million), appropriated in 1982, had run out. When a loan is extended to a strategic industry, the annual interest rate is set at two percentage points below the average interest rate set for long-term loans announced by the Bankers' Association of Taiwan.

Strategic industries that qualify under the provisions of the Statute for Encouragement of Investment are allowed a five-year exemption on business income taxes, and pay reduced duties on machinery and equipment imported for their own use. The Industrial Development Bureau (IDB) of the Ministry of Economic Affairs (MOEA) has provided US$3.75 million to aid firms needing financial and/or engineering assistance in the development of strategic products.

Qualified manufacturers receive aid (low-interest loans and/or engineering assistance from ERSO) for up to 50 percent of their expenses. The loans must be repaid within 10 years if the products developed are successful. Strategic electronic products (Table 17) include semiconductor shields, computers, peripherals, photostatic copy machines, lasers, disk-type projectors, microwave ovens, electronic switching systems, and transformers.

Taiwan also supports a research center to develop prototypes of new high-technology products. These products include bipolar ICs for use in color televisions, full-height hard disk drives, computer printers, software packages for locally made 16-bit personal computers, and a personal computer local area network (LAN) project. After the testing period of these prototypes is completed, the technology will be transferred to private firms for commercial application. According to the IDB, all these projects have strong export potential and are expected to become major electronic export products for Taiwan. The estimated annual market growth rate for hard disk drives is 110 percent and 30 percent for personal computer local area networks.

In addition, three Taiwanese companies and ERSO are jointly developing a 24-pin dot matrix impact printer. The IDB has also joined together 11 manufacturers of color televisions to research and develop digital television--the next generation of color television sets.

To further stimulate R&D in the electronics industry, MOEA is considering regulations that require electronics firms with a paid-in capital exceeding US$25 million to spend 1.5 percent of their annual revenue on R&D. Large firms in the information industry would have to spend 2 percent of annual revenue on R&D. Those firms that do not meet the requirement would no longer be eligible for tax incentives. A penalty fee equaling the shortfall between the required expenditure and the actual expenditure would be collected for a central R&D fund.

Aside from making direct loans, the authorities have assigned certain banks and financial institutions to purchase minority shares in strategic industries. At the end of 1983, China Development Corp. had invested US$6.05 million in the electronics industry. The Bank of Communications, in which the economic authorities (such as the Department of Industry Development and the National Science Council) also have controlling interest, has a 25 percent interest in Opto Tech Corp. Opto Tech will develop electro-optical semiconductors. The company will produce LEDs and will gradually turn out more advanced products such as photo diodes, photo transistors, and laser diodes.

Other projects being promoted by the authorities but as yet without producers are the development of high-resolution color television tubes, Chinese-language translation software, software and hardware for microcomputer CAD/CAM systems, warehouse-controlling software, modems, reel-to-reel magnetic tape drives, optical character readers, faster scan graphs, low-speed impact printers, and low-speed nonimpact printers.

INVESTMENT

Taiwanese economic authorities are making efforts to encourage foreign investors in the electronics industry, especially in those areas where investment would assist strategic industries through technology transfer. Taiwan's National Science Council established the Hsinchu Science-based Industrial Park, designed to play a role in Taiwan analagous to the Silicon Valley in the United States. Domestic and foreign private companies that invest in the park are eligible for incentives under the strategic industries program outlined above. Major technologies that Taiwan hopes to acquire include electro-optical semiconductors, optical fiber communications equipment, carbon fiber, industrial robots, servomotors and spindle motors, and remote-sensing exploration equipment.

Government R&D--Taiwan

Foreign investors in strategic industries have negotiable export requirements. Previously, at least 50 percent of production had to be exported, with many foreign investors exporting 100 percent of production. Now the component needs of domestic industry are so great that the requirement has been modified, and export requirements are negotiated on a case-by-case basis. According to current regulations, Taiwanese authorities impose local content requirements on only four products: color televisions, videocassette recorders, motorcycles, and vehicles.

There are three export processing zones (EPZs) in Taiwan. Investors in these zones are allowed to import components and raw materials duty free. Firms not located in the EPZs must pay duties on electronic components ranging from 10 to 30 percent. Semiconductors are on the low end of this duty range and frequency transformers for radio and television are at the high end. Generally, there is a customs surcharge of 5 percent on the C.I.F. value of an import and a harbor tax of 4 percent, except for some electronic components and raw materials for electronic production.

A number of U.S. and Japanese companies have opened manufacturing concerns, established joint ventures, licensed technology, or contracted OEM shipments in Taiwan to satisfy demand in their home markets. In 1984, approved foreign and overseas Chinese (i.e., Chinese who are U.S. citizens or permanent residents) investments in Taiwan increased 38.14 percent over the previous year, totaling US$558.74 million. The United States was the largest foreign investor with US$231.17 million, followed by Japan, Europe, Hong Kong, and others. Electronic and electric products accounted for most of the overall investment, with 47.9 percent or US$267.64 million.

To address the problem of restrictions imposed on certain exports from Taiwan, the economic authorities are encouraging Taiwan firms to invest overseas. The Reagan Administration's Caribbean Basin Initiative allows duty-free treatment of certain imports into the United States from 27 Caribbean nations. The initiative has aroused widespread interest and research into the investment climate in the Caribbean. Taiwanese firms are also investing in production and research facilities in developed countries in hopes of speeding the flow of technology to their home offices.

Government R&D Projects--Hong Kong

Hong Kong government has not yet established an electronics R&D organization, such as South Korea's KIET (Korea Institute of Electronics Technology) or Taiwan's ERSO (Electronics Research and Service Organization). This is because Hong Kong's electronics industry is still dominated by consumer products instead of computer systems, which will be the case in the foreseeable future. Also, to establish an electronics R&D organization is very costly.

However, the government has recognized that the continued expansion of Hong Kong's electronics industry depends heavily on an adequate supply of trained manpower. It has therefore embarked on a program of continued improvement of technical education. This includes further expansion of the universities and the polytechnics, provision of new technical institutes, industrial training centers, secondary technical and prevocational schools, the opening of a separate technical teachers' college, and the establishment of the Vocational Training Council.

The functions of the Vocational Training Council are:

- To advise on measures required to ensure a comprehensive system of technical education and industrial training suited to the developing needs of Hong Kong
- To initiate, develop, and operate schemes for training operatives, craftsmen, technicians, and technologists needed to sustain and improve industry, commerce, and services of Hong Kong
- To establish, operate, and maintain technical institutes and industrial centers

GOVERNMENT-FINANCED TRAINING SCHEME FOR ASIC DESIGN ENGINEERS

The government has recently approved the introduction of a scheme for the engineer training in ASIC design. The scheme was proposed by the Department of Industry. Its object is to encourage industrial firms to invest in ASIC design technology in Hong Kong by providing grants for training local engineers. It is hoped that the supply of properly trained manpower will quickly build up an ASIC design capability in Hong Kong. This is expected to help Hong Kong's industry to progress from essentially assembly-intensive work to the production of relatively high-performance, high value-added products.

Government R&D Projects--Hong Kong

The scheme involves inviting industrial firms in Hong Kong to apply for grants to pay for the training of ASIC design engineers. To be eligible, these firms must either have already set up or be contemplating setting up an ASIC design capability. They must also be able to arrange for the training to take place at an overseas ASIC design facility and cover one or more of the following areas: circuit design, layout design, or CAD engineering support.

A government training grant of up to HK$52,000 would be provided for each trainee to cover in whole or in part the cost of a round trip to an overseas facility, subsistence allowance, and training expenses over approximately a six-month period. Upon return, the trainee would be bound by a prior understanding to work in Hong Kong for at least two years.

Government R&D Projects--Singapore

Since 1981, US$30 million of Singaporean government funds, under a special grant scheme administered by the Science Council, has been allocated for local and multinational companies to engage in certain R&D activities. Government expenditure on R&D, which is expected to grow, has been mainly in engineering and technology. Several major multinational companies, Mentor Graphics and Seagate Technology of the United States, Nestle of Switzerland, and Det Norske Veritas of Norway, have set up large independent operations in Singapore to service the R&D and consulting needs of their subsidiaries or clients in Singapore and the region.

The government is also in the process of expanding the Singapore Science Park, which is a focal point for industrial R&D and information-related services in Singapore. Its proximity to the National University of Singapore (NUS) fosters close interaction and exchange of knowledge and ideas between university staff and industrial researchers.

The NUS has recently set out to establish itself as a center of quality education and research. Its target is to achieve an annual research expenditure equivalent to 5 percent of its annual operating budget within the next few years.

Joint R&D projects between the NUS and both industrial firms and public sector organizations (such as telecommunications, public works, and mass transit) have been encouraged. Some of the research areas (at the NUS and the Nanyang Technological Institute) that are potential industrial applications are:

- Robotics and artificial intelligence
- CAD/CAM, computer control, and microprocessor applications
- Biotechnology—plant genetics, immunology, and microbial genetics
- Applied optics and laser technology
- Semiconductor and silicon devices
- Hybrid IC processing technology
- Communications technology

In addition to the tertiary institutions, several government agencies provide a wide range of R&D consulting and other technical services to industry. The Singapore Institute of Standards and Industrial Research (SISIR) has set up innovation centers to assist industries in the areas of electrotechnology, process development, and industrial design. SISIR's new Materials Technology & Application Center provides services in materials evaluation and characterization, diagnostic and failure analysis, and materials processing. The Microprocessor Application Center (MAC), located at the NUS, provides advanced technical capabilities in microprocessor technology. Drawing upon the resources of the NUS, the MAC performs contract R&D for industries.

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Government R&D Projects--China

ORGANIZATIONS FOR SCIENTIFIC RESEARCH

The structure for research in China has five elements: the Chinese Academy of Sciences, the research departments in institutes of higher education, the research bodies of various industrial departments, local institutes of scientific research and mass scientific experimental organization, and the national defense research departments.

The State Scientific and Technological Commission was founded to plan, organize, and coordinate all research efforts; under it is the China Scientific and Technological Information Institute.

The Chinese Academy of Sciences

Founded in November 1949, the Chinese Academy of Sciences is the center for research in natural sciences. After its establishment, all existing research bodies were reorganized into 17 institutes, and new institutes were founded to do research in nuclear science, experimental biology, and other fields.

The Chinese Academy of Sciences is today a research center with some 36,000 scientists and technicians staffing more than 100 institutes engaged in research in many fields such as mathematics, mechanics, astronomy, physics, chemistry, zoology, botany, geophysics, computer technology, semiconductors, automation, and electronics.

The principal tasks of the Chinese Academy of Sciences are to conduct basic scientific and theoretical research, to conduct research into and develop new branches of science and technology, and to study major scientific and technological problems of a comprehensive nature arising in the course of China's economic development.

The Chinese Academy of Sciences establishes an Academicians' General Meeting, which is the leading body of the academy. Academicians are chosen from among outstanding scientists of the country. A presidium is elected on the Academicians' General Meeting and is the policy-making organ when the latter is not in session. The academy's president and vice presidents are chosen and elected among members of the presidium and assume leadership in daily administrative matters.

Apart from the Chinese Academy of Sciences, there are also a number of academies affiliated with various industrial departments. These deal with specialized research in such fields as agriculture, medical science, geology, architecture, the iron and steel industry, railway engineering, post- and telecommunications, and the textile industry.

PLANS AND PROSPECTS FOR THE SEVENTH FIVE-YEAR PLAN

The emphasis during the seventh Five-Year Plan (1986 through 1990) is on the achievement of higher production levels with existing technology rather than on trying to obtain state-of-the-art production capability. Consumer electronics for both domestic consumption and export will dominate new product lines. While many of the specific production targets of the plan are either still under formulation or have not yet been made public, five major product groups--integrated circuits, color television tubes, video recorders, computers, and program-controlled switchboards--have been selected for special development projects. Shanghai will be active in all of these areas, with the greatest emphasis to be on integrated circuits and television tubes. A considerable effort will also be mounted to increase both the quantity and variety of Shanghai-produced microcomputers.

Integrated Circuits

Most of the integrated circuits produced today are at the 7-micron to 10-micron level and include 4K and some 16K RAM chips. During the seventh Five-Year Plan, authorities plan to concentrate on volume production of 5-micron level chips in order to supply local assembly needs rather than trying to mass produce 1-micron to 3-micron chips. Other goals include the design of custom LSI chips for process control, video displays, and other specialized uses, as well as volume production of 16K RAM chips. Import plans emphasize integrated circuit production equipment and inspection systems.

Video Equipment

During the last five years, Shanghai has imported a large number of Japanese color television production lines manufactured by Hitachi, Toshiba, and National. When taken together with existing Chinese production facilities, these new production lines now make Shanghai the largest manufacturer of color televisions in the country, with current picture tube production at 50,000 per year. Despite a high percentage of locally produced components (80 percent in 1986, to grow to 85 percent in 1987), plans call for importing additional key equipment needed to further reduce the level of imported parts. Current R&D efforts are oriented toward practical applications also designed to reduce the import component of local electronics production. The emphasis is upon supplying the consumer electronics industries so as to produce more video recorders, color televisions, and video cameras. Development goals also include the manufacture of digital television sets, stereo television sets, and high-resolution computer monitors.

Government R&D Projects--China

Computers

Although Beijing continues to be the center of computer development in China, plans call for Shanghai to increase its production of both microcomputers and minicomputers. Shanghai does not plan to produce mainframe computers because of the long development time. Most computer components, boards, and subsystems are imported from Hong Kong, the United States, Japan, or Taiwan, then assembled in Shanghai. Locally produced components include resistors and capacitors. In the future, authorities hope that local sourcing of components can be increased to include PC boards, plastic computer cases, and power supplies. (Shanghai has just entered into a joint venture with a division of Kollmorgen to produce multilayered printed circuit boards.)

Current microcomputer production centers around the MS-DOS-based 16-bit East China 0520, a highly compatible IBM PC XT clone that uses the Phoenix brand ROM BIOS routines. While production capacity is around 10,000 units per year, foreign exchange shortages and competition with the Beijing-produced Great Wall brand IBM PC-compatible microcomputer have kept actual production levels at around 2,500 units per year. Some of the imported components used in the 0520 include 256K dynamic RAM chips, Seagate Winchester hard disk drives, and Data Technology Corporation (DTC) disk controllers. Chinese designs incorporating imported components are used for the input/output and monochrome video boards.

Other products presently produced locally include a single-board process control computer developed by Prolog that uses the STD bus standard. Typical uses are to control machine tools and small-scale power plants. While applications are still being designed to take advantage of this single-board architecture, approximately 10 models now exist including memory, CPU, and communications boards. The quantities produced, however, still remain small. Locally produced mass storage media have included the Control Data Corporation's 36-Mbyte 8-inch Winchester hard disk drive produced in Hangzhou and a Micro-science hard disk drive.

Goals of the seventh Five-Year Plan include an IBM PC AT-compatible microcomputer, the East China 0530, which has been under development for some time and is scheduled to go into production soon. Production plans in 1987 call for a total of around 500 units. These micros are specifically intended for use in the banking sector and can support as many as nine users under a Chinese-language version of the Xenix operating system, although they more typically support only four or five. The computer uses the Chips and Technologies-brand five-chip set as well as imported 256K dynamic RAM chips. One problem affecting production is the inability to purchase quantities of 80286 microprocessors. The Huang Pu Instrument Factory is scheduled to supply a BASF-brand 20-Mbyte, half-height Winchester hard disk drive for use in the system after manufacturing starts during 1987.

A major push is also under way to secure local production of a 32-bit CAD/CAM workstation. Based on the Motorola 68020, it will be a multiuser system using the UNIX operating system. Discussions are currently under way to jointly manufacture this workstation in cooperation with the U.S. company Apollo.

An 8-bit microcomputer has also recently been developed for use in China's school system. Modeled after the Laser 310, this microcomputer, called the Chang Jiang 800, uses a Z80A microprocessor. It will cost 400 to 500 renminbi. Basically only a keyboard, it has 16K of RAM and will use a cassette-tape mass-storage system. A second 8-bit microcomputer modeled after the Apple II Plus may also be developed, but no firm plans yet exist for this project.

A joint venture with Wang Computers, the Shanghai Wang Computer Development Corporation, also produces a version of the 16-bit Wang professional computer. Called the Ideographic Professional Computer (IPC), this system is made entirely from imported kits assembled in Shanghai. More important to Shanghai development plans, however, is the future production of the Wang VS-6 minicomputer. Based upon the Intel 80186 microprocessor, this system is capable of supporting as many as 16 users. Current production plans do not call for the export of either model.

The Cao He Jing Development District

Planners hope that the Cao He Jing Microelectronics Development District in the southwest of Shanghai will be the center of future microelectronics development. Factories already located in the district include the Number 14 Radio Factory, which produces MOS integrated circuits; the Number 12 Radio Factory, which produces potentiometers; the Number 22 Radio Factory, which produces capacitors; and the Number 12 Electric Meter Factory, which produces instruments. Development plans call for turning Cao He Jing into a center for integrated circuit development, particularly in the area of process control and factory automation. (Wuxi will be a center for telecommunications integrated circuits.) By encouraging wholly owned foreign enterprises, joint ventures, and cooperative ventures to locate in the district, authorities hope that Cao He Jing will become a center for computer, fiber-optic, and laser technology development as well.

The following list shows the major projects of China's seventh Five-Year Plan, from 1986 to 1990:

- CAD, CAM, CAT (computer-aided testing)
- VLSI

- 16-bit PCs (volume production)
- 32-bit microcomputers
- Fiber-optic and laser technology
- Semiconductor materials
- Switching systems

SHANGHAI

Responsibility for the operational management of most of Shanghai's electronics industry production rests squarely with the Shanghai Municipality. Although subject to broad central government policy guidelines, local authority over research, production targets, and administrative organization is exercised through a variety of municipal bureaus and corporations all falling under the direction of the Shanghai Municipal Economic Commission. Together with the city's Planning Commission, Science and Technology Commission, and Foreign Economic Relations and Trade Commission (SMERT), the Municipal Economic Commission determines funding levels and resources allocation for the entire Shanghai electronic industry. Overall industry development is, to some extent, overseen by an advisory body created in 1984, the Shanghai Municipal Leading Group for Electronics headed by Vice Mayor Liu Zhenyuan, and the Shanghai Municipal Subcommittee on LSI Technology headed by Chen Xinxiang, under the Municipal Science and Technology Commission.

Some research and manufacturing is conducted under central government control, albeit on a smaller scale. The administrative organization of the industry's factories and research institutes is currently under reform, including the abolition of the Shanghai Instrumentation and Electronics Industry Board (SI&EIB) industrial corporations. Planned changes call for the creation of a publicly held limited corporation for the vacuum device industry and the division of import-export activities according to product types rather than hierarchical affiliation.

Local Control of the Industry

By far the largest portion of the electronics industry is controlled by the SI&EIB. Additional electronics manufacturing and research is carried out under the guidance of the Shanghai Aeronautics Industry Bureau (SAIB), the Shanghai Post and Telecommunications Bureau (SPTB), the Light Industrial Bureau, and the Number Two Light Industrial Bureau. Much of the computer-related electronics production is administered by the Shanghai Computer

Corporation (SCC), which until 1984 was under the SI&EIB. Additional research and some very limited production is also conducted at East China Normal University, Fudan University, Jiaotong University, Keji University, Shanghai Electric Machinery Institute, Shanghai Maritime Institute, and Tongji University.

The SI&EIB

Accounting for 22 percent of the total output of electronics products in all of China, the SI&EIB is responsible for a total of 165 factories, eight research institutes, and approximately 200,000 workers (of which 15,000 are engineering technicians) distributed among the following areas:

- The broadcasting and television industry, which has a total of 38,000 employees (of which 10 percent are engineering technicians) and 39 factories (21 of which produce entire assemblies, 12 produce parts and components, and 6 are finishing plants). Main products include stereos, amplifiers, telecommunications equipment, radio stations, transmitters, and radar.

- The electronic component industry, which has a total of 30,000 employees (of which 9 percent are engineering technicians) and 30 factories. Main products include resistors, capacitors, and connectors.

- The semiconductor device industry, which has a total of 20,000 employees (of which 12 percent are engineering technicians) and 27 factories, including the Numbers 5, 14, and 6 factories. (Numbers 5 and 14 are two of China's most advanced microelectronics factories; Number 6 produces thick and thin film circuits.) Main products include diodes, transistors, and integrated circuits.

- The optical instrument industry, which has a total of 8,000 employees (of which 12 percent are engineering technicians) and 12 factories. Main products include telescopes, spectrum analyzers, chromatic analyzers, and analytical instruments.

- The instrument and equipment industry, which has a total of 38,000 employees (of which 10 percent are engineering technicians) and 37 factories (30 of which produce complete devices, 6 are finishing plants, and 1 is collectively owned). Main products include computerized process control instruments, power transmitting equipment, and electronic analysis equipment.

- The instrumentation industry, which has a total of 35,000 employees (of which 10 percent are engineering technicians) and 57 factories (29 of which produce entire assemblies, 14 product parts and components, and 14 are finishing plants). Main products include 2,000 different types of instruments.

- The electrical vacuum device industry, which has a total of 15,000 employees (of which 8.5 percent are engineering technicians) and 17 factories. Main products include transmitting tubes, high-frequency tubes, vacuum tubes, cathode ray tubes, oscilloscopes, optical multiplying tubes, and high-pressure sodium lamps.

- The electric motor, electric wire, and electric cable industry, which has a total of 3,700 employees (of which 8.5 percent are engineering technicians) and 47 factories (11 of which produce electric machinery, 11 produce electric wire and cable, and 25 produce electric material and equipment). Main products include various kinds of small and middle-size AC and DC power generators, wires, cables, and 40 major kinds of electrical equipment.

- The calculator industry, which has a total of 7,000 employees (of which 15 percent are engineering technicians) and nine factories (three of which produce entire assemblies, three produce peripheral equipment, and three produce miscellaneous electronics). Main products include small, middle-size, and large microelectronic calculators and single-board computers, and more than 10 kinds of peripherals including CP-81 magnetic disks, and text-symbol displays.

The eight research institutes that are directly affiliated with the SI&EIB cover the following areas:

- Broadcasting and television
- Electronic components
- Semiconductors
- Optical instruments
- Instrumentation research
- Electrical vacuum devices
- Scientific and technological information
- Standards and measures

The SAIB

The SAIB also has control over part of the Shanghai electronics industry, with a total of 25,000 workers (of which 30 percent are engineering technicians), eight factories, and six research institutes involved in civilian electronics production. The following are the eight SAIB-controlled factories:

- The Shanghai You Xian Dian Factory, which produces radiofacsimile instruments (for both meteorological maps and text), satellite antennas, assembly tools and jigs, assembly plunger dies, and hanging fans
- The Xinhua Radio Factory, which produces tape recorders
- The Shanghai Broadcasting Equipment Factory, which produces television sets, television broadcasting equipment, and color and black-and-white television monitors
- The Xinya Machine Factory, which produces satellite antennas, earth stations, and broadcast telecommunication equipment
- The Xinyue Instrument Factory, which produces electron microscopes with 200TT to 800TT resolution, scanning lenses, mass spectrographic analyzers, and X-ray screen analyzers
- The Shanghai Instrument Factory, which produces robots and analytic instruments
- The Xinguang Telecommunications Factory, which produces complete long-distance telephone bureau facilities, relays, conjunctions, and plungers
- The Chang Ling Xue Battery Factory, which produces millicrystalline silicon solar cells

The SPTB

The SPTB, under the Ministry of Post and Telecommunications, is also responsible for a portion of the Shanghai electronics production through its administrative body, the Shanghai Post and Telecommunications Industrial Corporation. While most of the equipment and instruments manufactured by the corporation's eight factories are for use in the telecommunications industry, some are supplied to railroad, ocean shipping, air transport, broadcasting, public security, and military end users. The eight factories of the Shanghai Post and Telecommunications Industrial Corporation, together with two enterprises directly under the Ministry of Post and Telecommunications, have a total of 10,000 workers (10 percent of which are engineering technicians). The 10 factories are as follows:

- The Shanghai Communications Equipment Factory, which produces digital telecommunications devices, optical telecommunications equipment, 60-channel symmetrical cable carrier instruments, and teletypewriters
- The Shanghai Telephone Equipment Factory, which produces automatic switchboards with longitudinal and latitudinal control systems, and long-distance switchboards
- The Wanli Radio Factory, which produces urban telephone equipment
- The Shanghai Number 1 Telecommunications Equipment Factory, which produces urban telephone equipment and wires
- The Shanghai Number 2 Telecommunications Equipment Factory, which produces long-distance telephone equipment
- The Shanghai Number 3 Telecommunications Equipment Factory, which produces urban telephone equipment and telephone switchboards with longitudinal and latitudinal automatic control systems
- The Shanghai Number 5 Telecommunications Equipment Factory, which produces telegraph equipment
- The Shanghai Number 6 Telecommunications Equipment Factory, which produces microtelecommunication devices, fiber-optic telecommunication instruments, telephones, antenna transmitter exchangers, and noninductive resistors
- The Shanghai Red Wave Telephone Equipment Factory, which produces telegraph equipment
- The New People's Telecommunications Equipment Factory, which produces telephone equipment

The SCC

The SCC is directly responsible for three factories: the Shanghai Computer Factory, the Changjiang Computer Factory, and the Huangpu Instrument Factory.

The SCC is also involved in two manufacturing joint ventures through a subsidiary organization, the Shanghai Computer Development Corporation. One is with Wang Computers, which produces Wang Ideographic Professional Computers and plans to produce the Wang VS-b. The second, signed on December 31, 1986, is with the PCK Division of Kollmorgen Corporation, and will produce layered printed circuit boards. (The Shanghai Instruments Factory, which is under the SAIB, is also a partner in the latter joint venture.) The Shanghai Computer Corporation's two remaining enterprises are the Computer Technology Service Company, which is responsible for value-added software modification, and the Shanghai Computer Technology Research Institute.

Shanghai Branches of SEIECO and CEIEC

Three organizations share responsibility for the import-export activities of the Shanghai electronics industry. The first and foremost in terms of volume is the trading corporation under the SI&EIB, the Shanghai Electronics Import-Export Corporation (SEIECO). The second organization is the Shanghai branch of the Ministry of Electronics Industry (MEI), the China Electronics Import-Export Corporation (CEIEC). It sometimes directly involves Beijing in electronics imports and exports within the municipality. CEIEC's primary concern, however, is with the other provinces that make up the Greater Shanghai Economic Zone. While not directly involved in electronics imports-exports, SMERT also participates in the review process that precedes decisions on technology imports and foreign investment.

Direct Central Government Involvement

Not all of the administration of the Shanghai electronics industry occurs at the local level. In fact, a significant amount of civilian electronics research and some production is directly controlled by Beijing. In addition to the Shanghai Metallurgy Research Institute (of the Chinese Academy of Sciences), which studies semiconductors, LSI technology, and superconductors, there are a host of local research organizations affiliated with at least seven different Ministries. The MEI has five research institutes in Shanghai with a total of 5,000 employees (of which 50 percent are engineering technicians):

- The Shanghai Micromotor Research Institute, which researches the design and manufacture of special (dynamo) microgenerators

- The Shanghai Cable Research Institute, which researches transmission cables, fiber-optic cables, photoinduction source elements, optical cable television systems, and fiber-optic transmission systems

- The East China Computer Technical Research Institute, which researches and manufactures large and medium general-purpose computers, microcalculators, specialized computers, software, calculator circuits, and multilayer printed circuit boards

- The Shanghai Microwave Technical Research Institute, which researches remote measuring systems for microwave telecommunication radar and millimeter-wave telecommunication radar, and microwave and millimeter-wave instruments and equipment

- The Shanghai Microwave Equipment Research Institute, which researches and manufactures digitized microwave instruments

- The Ministry of Aeronautics Industry (MAI) has two research institutes in Shanghai with a total of 2,000 employees (of which 20 percent are engineering technicians)

- The Changjiang Scientific Instrument Factory, which researches and manufactures measuring instruments and 16K microcomputer systems

- The Number 615 Research Institute

The Ministry of Post and Telecommunications Industry has two research institutes in Shanghai: the Number 1 Post and Telecommunications Research Institute, and the Number 3 Post and Telecommunications Research Institute.

Other Beijing-controlled research institutes in Shanghai include the Ministry of Broadcasting, Television and Film's China Record Corporation, the Shanghai Record Factory, and the Ministry of Railways-controlled Shanghai Communications Equipment Factory, which has 1,000 employees (of which 10 percent are engineering technicians), and researches and manufactures data communications equipment. The Ministry of Machine-Building Industry (now called the Commission on Machine Building) and the Ministry of Light Industry also administer electronics research institutes in Shanghai.

AN INDUSTRY UNDER REFORM

In early December 1986, the SI&EIB implemented the first phase of an ambitious organizational reform of the entire Shanghai electronics industry by abolishing all seven of its industrial corporations, which administered the broadcasting and television, electronic components, semiconductor devices, optical instruments, electronic instruments and equipment, instrumentation, and electrical vacuum devices industries.

Phase two of the reform has just been initiated and is, in fact, still under discussion. The SI&EIB hopes to reorganize enterprises not currently under its control, as well as those that are; the extent to which the SI&EIB will be able to achieve these goals is unclear. Nevertheless, several important features of the Bureau's new administrative structure have already emerged. A new publicly held limited corporation will be formed from the enterprises formerly organized under the Shanghai Electrical Vacuum Device Industrial Corporation. To be established by the first quarter of 1987, this new corporation will be directly under the SI&EIB, will possess an independent administration, and will be in charge of its own marketing and R&D. Apparently few if any changes will be made in the structure of the enterprises participating in the new organization, which are both few in number and distinct from other enterprises under the SI&EIB.

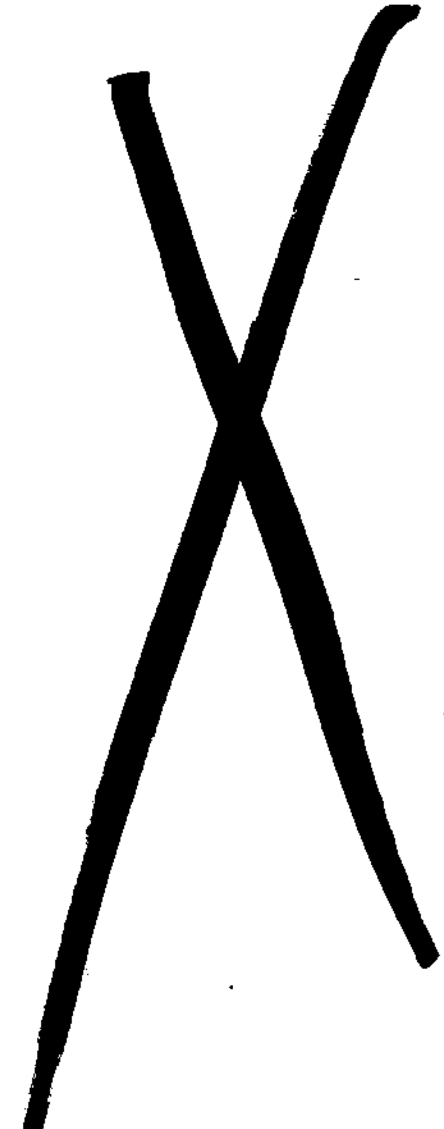
A second, more radical organizational change has a direct impact on the factories and research institutes of the entire Shanghai electronics industry. It involves the grouping of like production and research facilities into a single organizational entity empowered with legal person status and therefore able to sign contracts for each member enterprise. This new organization differs from the former industrial corporations in two fundamental ways: all-important administrative functions are handled at the bureau level, and the organizations' membership is not limited to the enterprises presently under the direct control of the SI&EIB.

Current plans call for the formation of at least four such organizations. One, the Automated Instruments Group (Zi Dong Hua Yi Biao Ji Tuan), has already been established and is responsible for 25 factories. The organization's leading officers are appointed by the SI&EIB and include one general manager, three deputy general managers, and one chief engineer. The other new groups are still being formed but have the following tentative names: the Electrotechnical Measurement Instruments Group (Dian Gong Ci Liang Yi Qi Ji Tuan), the Instrument Materials and Components Group (Yi Biao Cai Liao Yuan Qi Jian Yi Tuan), and the Scientific Instruments Group (Ke Xue Yi Qi Ji Tuan).

A similar organizational change is planned for the computer industry. Scheduled to be put into effect during the first quarter of 1987, the new organization, called the Yangtze United Computer Group (Changjiang Jisuanji Lianhe Jituan), is to take charge of the administrative tasks and overall coordination of Shanghai's computer industry. All computer-related enterprises, including those not now belonging to the Shanghai Computer Corporation, will be invited to participate in this new group as equal members. The Shanghai Computer Corporation will dispense with its administrative duties and concentrate on manufacturing. The new organization will be headed by Mr. Wang Haoyang, who will also retain his position as the senior deputy general manager of the SI&EIB. As a result, despite its formal position under SMERT, this new group may in fact be administered by the bureau.

The push to recognize the industry also has implications for the import-export corporations. Perhaps the least clear of any of the planned changes, this organizational reform calls for a division of industry import-export activity between SEIECO, the CEIEC Shanghai branch, and the

China National Machinery and Equipment Import-Export Corporation (CMEIEC) Shanghai branch. According to a senior representative of the SI&EIB, this would involve the SEIECO and the CEIEC Shanghai branch jointly handling the import-export concerns of the SI&EIB-controlled factories that are specifically engaged in electronics production and fall under the final authority of the MEI. Similarly, the CMEIEC would handle the import-export activities of the SI&EIB instrumentation factories, under the final authority of the Machine Building Commission. A representative of the CEIEC Shanghai branch outlined another scenario for this merger, which called for the formation of a new organization under SMERT combining SEIECO with the CEIEC Shanghai branch. Although the specific formula for the division of import-export responsibility has apparently yet to be determined, it is clear that whatever form the new division takes, it will reflect an even greater level of local control over the electronics industry in Shanghai.



High-Technology Zones—Hong Kong

INDUSTRIAL TOWNS AND ZONES

Hong Kong's government has developed new towns that are self-contained communities providing housing, employment, schools, shopping, and community facilities. Table 1 provides details on these areas, including approximate selling and rental prices for industrial facilities.

Tsuen Wan New Town is about 9.3 miles from Kowloon. The township includes the adjacent area of Kwai Chung—with its modern container terminal—and Tsing Yi Island, which is connected to the mainland by a road bridge. A second linking road bridge will be completed in 1987. There are about 10,980 factories in the area producing a wide range of consumer goods and other light industrial products. Tsuen Wan's population of about 700,000 is predicted to be about one million by 1993.

Tsing Yi Island accommodates mostly medium to heavy industries. Those already established make cement, corrugated paper, marine outboard engines, polystyrene, and boats. Ship and oil rig repairing are also important, and a number of large dockyards have been built.

Tuen Mun New Town is about 20 miles from Kowloon. A six-lane highway between Tuen Mun and Tsuen Wan reduces traveling time between the two towns to 25 minutes.

Currently the home of more than 200,000 people, Tuen Mun, when fully developed, will house more than 500,000 people and provide 158 hectares of industrial sites. Some of this area is for heavier and land-intensive industries, providing a more balanced and integrated economic structure and better prospects for skilled workers. About 1,490 factories have already been established in Tuen Mun, including a zipper factory, a large toy factory, a dairy, and a heat-transfer printing paper plant.

Sha Tin is 8.7 miles from Kowloon and is on the Kowloon-Canton Railway. At present accommodating 250,000, Sha Tin will have a population of more than 800,000 when fully developed and provide 60 hectares of light industrial sites in three main districts. About 1,170 factories have already been established in Sha Tin.

Kwun Tong, a district within the urban area, is situated about 6.2 miles from the southern tip of Kowloon and 3.1 miles from the airport. It is served by a major trunk road, underground railway, and both passenger and vehicular ferries to Hong Kong Island. There are 5,600 factories in Kwun Tong engaged mainly in textiles, electronics, electrical, plastics, metalware, rubber, paper, and light machinery industries. Ample labor supply is ensured by its population of more than 600,000 living in nearby public housing estates.

Other well-established industrial areas include Aberdeen/Wong Chuk Hang and Chai Wan on Hong Kong Island, and San Po Kong and Cheung Sha Wan in Kowloon. More than 11,000 factories are established in these areas.

Table 1

Industrial Towns and Zones—Hong Kong

District	Labor Force	Number of Manufacturing Establishments	Industrial Premises: Approximate Selling Price per Square Meter		Industrial Premises: Approximate Monthly Rental Price per Square Meter	
			Ground Floor	Upper Floor	Ground Floor	Upper Floor
Chai Wan/Shau Kei Wan	99,800	1,550	HK$6,000-HK$8,000 US$769-US$1,026	HK$3,000-HK$4,000 US$385-US$513	HK$50-HK$70 US$6-US$9	HK$30-HK$40 US$4-US$9
Wong Chuk Hang/ Aberdeen	95,400	960	HK$8,000-HK$9,000 US$1,026-US$1,154	HK$3,500-HK$5,000 US$449-US$641	HK$70-HK$80 US$9-US$10	HK$30-HK$45 US$4-US$6
Cheung Sha Wan/ Lai Chi Kok	184,300	6,010	HK$9,000-HK$10,000 US$1,154-US$1,283	HK$4,000-HK$5,000 US$513-US$641	HK$80-HK$90 US$10-US$12	HK$35-HK$45 US$4-US$6
Kwun Tong/San Po Kong	561,300	9,800	HK$6,000-HK$8,000 US$769-US$1,026	HK$3,500-HK$4,500 US$449-US$577	HK$50-HK$70 US$6-US$9	HK$30-HK$40 US$4-US$5
Tuen Wan	293,300	10,980	HK$5,500-HK$7,000 US$705-US$897	HK$2,500-HK$4,000 US$321-US$513	HK$50-HK$60 US$6-US$8	HK$20-HK$35 US$3-US$4
Tsuen Mun	35,300	1,490	HK$3,000-HK$4,500 US$385-US$577	HK$1,500-HK$2,500 US$192-US$321	HK$30-HK$40 US$4-US$5	HK$15-HK$25 US$2-US$3
Sha Tin	49,700	1,170	HK$4,500-HK$6,000 US$577-US$769	HK$2,500-HK$3,500 US$321-US$449	HK$40-HK$55 US$5-US$7	HK$20-HK$30 US$3-US$4

Source: Dataquest
September 1988

HONG KONG INDUSTRIAL ESTATES

The Hong Kong Industrial Estates Corporation develops and manages fully serviced industrial estates to enable industries with relatively high levels of technology, but which cannot operate in ordinary multistory factory buildings, to set up in Hong Kong. There are two industrial estates:

- The Tai Po Industrial Estate, with a total of 69 hectares of land
- The Yuen Long Industrial Estate, with 67 hectares of industrial land

Land on the industrial estates is sold by the corporation to applicants at premia based on cost. The land premium, at HK$800 per square meter/HK$74 per square foot, is payable by installments over 10 years, or as a lump sum upon signing the Agreement for Lease. In addition, lessees pay a stamp duty up to a maximum of 2.75 percent of the sale price, and thereafter, they pay a normal rental fee plus an annual charge to cover the cost of general management and maintenance.

The industrial projects most likely to contribute to the Corporation's objective will be those proposing investment in plant and machinery that will introduce new or improved technology or products. Sites are immediately available in both Tai Po and Yuen Long Industrial Estates. By the end of 1987, 91 companies had been granted sites on the two estates.

Besides providing sites to industrialists for the construction of their own per specification factory buildings, the corporation also provides prebuilt factory premises for those who wish to begin production with a minimum of delay. These standard factories are fully serviced and provide maximum flexibility. In each of the estates, one four-story standard factory and three blocks of single-story standard factories have been constructed and occupied, and a contract has been awarded for two more single-story standard factories to be built on the Yuen Long Industrial Estate.

By the end of 1987, 52 hectares of land remained available for use. Consideration is now being given to the construction of a third industrial estate.

Further information and application forms may be obtained from:

Address: The Hong Kong Industrial Estates Corporation
Suite 107 Estate Centre Building
19 Dau Cheong Street
Tai Po Industrial Estate
New Territories, Hong Kong

Telephone: 0-6531183

Cable Address: INDESTATES

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High-Technology Zones--Singapore

SINGAPORE SCIENCE PARK (SSP)

The Singapore Science Park (SSP) is developed and managed by the Jurong Town Corporation. Routine administration and promotion are handled by the Science Council of Singapore and the Economic Development Board. Adjacent to the National University of Singapore, the SSP is established to accommodate pure R&D organizations as well as R&D activities relating to the manufacture of high-technology products.

The first private-sector tenant, the Marine Technology Centre of Det Norske Veritas, became operational in late 1983. Several Starter Unit tenants, including Austek Microsystems, Robin Electronics, Robot Leasing and Consultancy, Scientech-Intraco, and Seagate Technology, began their R&D operations in SSP in 1984. Companies that have set up R&D operations at the Park since 1984 include Diagnostic Biotechnology, Mentor Graphics, Plantek International, Tata-Elxsi from the United States; Takasago from Japan; and Singaporean firms Automation Applications Center and Radan Systems.

At the latest count, 16 companies or organizations had been admitted to the Park. The 13 companies currently operating have a combined total of 155 employees. The Jurong Town Corporation is continuing to provide new facilities for new tenants.

Also located in SSP is the Science Council of Singapore, the government agency that promotes science, technology, and R&D. The Science Council administers both the SSP and the government Research and Development Assistance Scheme (discussed later). The Science Council's role is to facilitate communications between SSP tenants and tertiary institutions and the Singapore government.

The SSP has been developed in four phases. Phases I and II occupy 50 hectares (123.5 acres); Phases III and IV occupy 65 hectares (160.6 acres). Currently, Phase I is fully occupied, and Phase II is about 15 percent occupied.

The SSP is situated next to the National University of Singapore and the Institute of Systems Science. Nearby are other technical institutions of higher learning such as Nanyang Technological Institute and Singapore Polytechnic, among others. Also nearby are the central district of Singapore and the Singapore Changi International Airport.

In the SSP are the facilities of the National Computer Board and the Singapore Institute of Standards and Industrial Research. A computer center, science and engineering libraries, telecommunications, postal services, and other support services are available in the Park and at the National University of Singapore.

Situated in one of the SSP's ready-built starter units is the Innovation Centre. This facility is subdivided into small individual units designed for local investors, small R&D companies, and consulting firms. As is true of the SSP in general, the Centre is serviced and administered by the Science Council of Singapore.

Incentives

No special explicit incentive measures are available to SSP tenants, but the same investment incentives that prevail throughout Singapore are available to them. Two government R&D promotion schemes that may be of particular interest to tenants are described below.

Research and Development Assistance Scheme

The S$50 million (which equals US$23.9 million at S$2.09/US$1.00 throughout this section) Research and Development Assistance Scheme fund provides financial assistance to major R&D projects it deems to be of national importance and technological significance. Private sector companies and public agencies are eligible to apply for funding, which covers up to 100 percent of approved direct project costs. The focus of the scheme is on infrastructure building, technical innovation, and training of the local research staff. Generally, projects eligible for grants require one to five years to complete. No maximum limit is set on grant value.

Product Development Assistance Scheme

The Product Development Assistance Scheme is set up as a means to develop local applied research and product development capability and to enhance indigenous technology. Its intent is to encourage local companies to develop new products and processes or improve existing ones.

Grants under this scheme will be used for product or process development work carried out in house or through outside agencies. Where foreign consultants are engaged, the cost will be supported only if there is close collaboration with local engineers and scientists to effect technology transfer.

Singapore companies with majority shareholding by Singapore citizens or permanent residents are eligible to receive grants under this program. Proposed development projects should preferably be closely related to an applicant's existing manufacturing activities and should involve substantial technical improvements to the products or processes, not merely cosmetic changes in product design.

The scheme provides grants equal to 50 percent of approved direct development costs of an approved project, including labor, equipment, materials, consulting, and utilities. For grants exceeding S$50,000 (US$23,900), an external auditor's certification is required.

Admissions

Admission to the SSP and the criteria for grant of leases is determined by the Science Park Admissions Committee. Generally speaking, all nonpolluting scientific and industrial R&D activities that are not land-intensive are welcomed. Desirable operations include:

- Advanced Electronics Development--Computers and peripherals, communications equipment, IC design and fabrication, microprocessor applications, computer software development, artificial intelligence research

- Product Test and Analysis Services--Product performance and reliability testing, device failure analysis, materials testing, product and process development

- Medical and Scientific Instruments Development--Specialized medical products, electromedical instruments, scanners, analytical instruments, artificial organs

- Biotechnology R&D—Genetic engineering, plant and food research, waste treatment, antibiotics and vaccines, cancer drugs, diagnostic kits

- Industrial Robots and Automation Equipment Development--Robotics, special-purpose machines, microprocessor-based control systems, automatic insertion machinery, flexible manufacturing systems

- Optical and Laser Technology—Design and development of new systems and materials, holography, laser medical applications, fiber-optic communications

- Chemical and Plastics R&D—Biochemicals, fine chemicals, pharmaceuticals, polymers

Application Procedure

Written applications for the SSP must be submitted to any of the following:

- Science Council of Singapore
  63, Block 1 Science Park Drive
  Singapore 0511
  Telephone: 7797066
  Telex: RS 39055 SCICO
  Fax: 7771711

- Singapore Economic Development Board
  1 Maritime Square #1040
  World Trade Center (Lobby D)
  Singapore 0409
  Telephone: 2710844
  Cable: INDUSPROMO
  Telex: RS 26233
  Fax: 2710844
  (or any of the Board's worldwide offices)

- Jurong Town Corporation
  Jurong Town Hall
  Singapore 2260
  Telephone: 5600056
  Cable: JUTOWN
  Telex: RS 35733
  Fax: 5655301All

Park admission applications are submitted to the Science Council secretariat for review and allocation by the Science Park Admissions Committee.

Land Leases

Fully prepared and serviced sites are available for R&D organizations that prefer to construct their own buildings to suit their specific requirements, as long as they do not exceed the Park's land-use and height restrictions. Thirty- to sixty-year leases are available for these sites.

Starter Units

Ready-built starter units designed for flexibility of use are also available on a rental basis. These units are suitable for a variety of advanced technological activities and are leased for three-year periods with a renewal option for additional three-year terms.

High-Technology Zones--China

INTRODUCTION

China has spelled out its strategies for high-tech development. The high-tech zones combine local, inexpensive brainpower and labor with foreign capital and management to concentrate on the six critical technological fields in China's 1990 to 2000 all-out electronics industrialization. The areas of technology are information, laser, aerospace, automation, energy resources, and new materials. Each of the high-tech zones are unique approaches, but fit into the central government's basic development strategy.

ZHONGGUANCUN, BEIJING

Zhongguancun, a northwestern district of Beijing, is another high-tech zone in China. Beijing University, Qinghua University, and several state-run research academies are among those in the district. Right now, there are approximately 100 high-tech companies operating in the area, developing and marketing computer, electronic, chemical, and biotechnology products. Most are directly under or connected to the Academy of Sciences, although about one-third of the businesses, primarily smaller enterprises involving only sales, are privately run.

CAOHEJING MICROELECTRONIC INDUSTRIAL PARK

The Caohejing Microelectronic Industrial Park contains facilities chiefly for the development of microelectronics technology including computers, large-scale integrated circuits, optical fiber communications, lasers, and robots. It is situated in Shanghai and covers five square kilometers.

Recently built around the industrial park were a 220-kV transformer substation, a 20,000-line telephone exchange, a waterworks, a gasholder plant, and a sewage treatment plant.

The ceremony for laying the park's foundation stone was held September 26, 1986. The first phase of the project included mainly the building of infrastructures (roads, bridges, drainage, water, electric, gas, and telecommunications systems) and the building of factories and research institutions. There have been more than 50 research institutes engaged in the development and manufacturing of high-technology products. These new ventures are both foreign and domestically financed. Philips Inc., of Holland, and Bell Inc., of Belgium, are two recent multinationals to invest in Caohejing. Under the plan, relatively concentrated living facilities and an administrative center will be set up simultaneously in the industrial park. Service facilities in the park will include banking, insurance, epidemic prevention, customs, commodity inspection, and product displays catering to foreigners.

Preferential investment regulations, tax treatment, and investment provisions, are currently given to foreign-invested enterprises in the high-tech park. Those benefits come under income tax, real estate tax, and consolidated industrial commercial tax.

The Shanghai Caohejing Microelectronic Industrial Park Development Corporation has been authorized by the Shanghai municipal government to develop and manage the industrial park, and to provide consultancy and agency services for absorbing overseas funds and technology in the park. The corporation's address is 509 Cao Bao Road, Shanghai, (cable: 9069 Shanghai; telephone: 361072, 360607).

TIANJIN ECONOMIC-TECHNOLOGICAL DEVELOPMENT AREA (TEDA)

TEDA is located on Tianjin Port approximately 40 kilometers from Tianjin's city center and three hours by train from Beijing. TEDA houses foreign investments related primarily to high technology. In 1991, a Beijing-Tianjin-Tanggu expressway will reduce traveling time from China's capital by half. Infrastructure projects are planned up to the year 2000 and five new power plants currently are under construction.

At present, a two-stage expansion project is under way to dramatically increase the 3-square-kilometer area to 33 square kilometers by the year 2005. The first US$100 million investment phase, ending between 1990 and 1991, is to house 150 to 200 projects with a total output value of at least US$300 million. Five hotels have been constructed, as well as an amusement park offering a swimming pool, tennis courts, and a sports stadium. By 2005, TEDA's industrial output should be more than US$5.4 billion (Rmb 20 billion).

Much of the electronics industry in this high-technology zone is engaged in low-end production such as TV sets, watches, and refrigerators. The aim is to eventually launch this zone into such projects as personal computers, minicomputers, and mainframes. Various high-tech projects with Motorola, IBM, Johnson & Johnson, Seiko of Japan, and NEC will finish negotiations in 1989. Motorola has already invested US$60 million in a computer manufacturing plant. Of the 293 approved projects, 273 are equity joint ventures, 12 are cooperative joint ventures, and eight are wholly foreign owned. In 1988, 30 projects went into operation, and 40 more are likely to be approved in early 1989.

WUHAN DONGHU NEW TECHNOLOGY DEVELOPMENT ZONE

Wuhan Donghu New Technology Developement Zone (WDNTD) is currently China's only inland high-tech development zone. WDNTD is located in the city of Wuhan, Hebei Province, which is more than 500 kilometers west of Shanghai on the Yangtze River (Changjiang) and 1,000 kilometers north of Canton (Guangzhou). Wuhan is located nearly in the middle of the Beijing-Guangzhou express railway.

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WDNTD was China's first High-Technology Zone (HTZ) but remains one of the most unfamiliar to foreign investors. The 43-square-kilometer zone encloses 21 colleges and universities, 54 scientific research institutes, and 76 large and medium-size enterprises with a scientific and technical staff of over 60,000.

WDNTD's main technical work consists of developing the applications of high-power carbon dioxide lasers, researching long distance fibre cable communication systems, developing fiber optic technology, and genetic engineering.

Under a three-stage plan that began in 1985, WDNTD merges research with industrial use. In the first stage, WDNTD improved working conditions, production efficiency, and education. During the second stage (1988 to 1995), new technologies are being imported from abroad to "join competition in the international technology market." From 1995 to 2000, WDNTD will enlarge its development capacity, with special attention paid to cooperation with other industrial gardens inside and outside of China.

GUANGZHOU WANGSHAN SCIENTIFIC AND TECHNOLOGY DEVELOPMENT AREA

Guangzhou Wangshan Scientific and Technological Development Area (GWSTD) has an area of approximately 30 square kilometers and is located 10 kilometers southeast of the city center in China's most prosperous province, Guangdong. Proximity to Hong Kong and the Shenzhen Special Economic Zone (SEZ) gives GWSTD an advantage to other HTZs for attracting foreign capital.

GWSTD is divided into four townships: Gangding, Changbing, Longdong and Cencun. Gangding is considered primary because of the research capabilities of the institutes, universities, and colleges within the township as well as its central location within the area. The western adjacent Changbing area emphasizes research and development in microelectronics, precision instruments, and new materials. Longdong is a trial industrial area, north of Gangding, which focuses on forestry, food engineering, and environmental protection. Cencun is a spacious area reserved for future expansion of GWSTD.

GWSTD takes full advantage of Guangzhou's very open economic policy by importing advanced technology. It strives to become a highly integrated industrial park with interaction between four major centers: a high-level scientific research center, which is a cooperative effort between the universities and industry, a research center for academic and theoretical experimentation, an area dedicated to applications or product development and sales, and a center capable of finding and importing appropriate foreign technology.

High-Technology Zones--Taiwan

SCIENCE-BASED INDUSTRIAL PARK (SIP)

In 1980, Taiwan established an industrial park entirely devoted to high-technology industries, the Science-Based Industrial Park (SIP). By fostering investment and development in high-profile industries, Taiwan hopes to upgrade its industrial structure.

The SIP offers high-technology investors an environment for research, development, and manufacturing that includes attractive incentives and a well-established infrastructure.

The SIP is located in Hsinchu, a fast-growing city about 80 kilometers southwest of Taipei. It includes industrial, research, and residential zones, as well as public utilities. Still expanding, the SIP will eventually occupy 2,100 hectares (5,189 acres).

The SIP is at the heart of Taiwan's modernization plans, which extend through the end of the century. The list of SIP investment advantages includes a strategic location, abundant technical manpower, a supportive industrial and business environment, and attractive incentives for high-tech oriented investment projects. Taiwan has created a favorable environment for overseas investors because what benefits SIP companies benefits Taiwan. Development of strategic industries in Taiwan is intended to raise living standards and keep Taiwan's economy competitive into the twenty-first century.

Technical and Human Resources

A number of institutes of higher learning and research are located within the SIP. This means that the park always has access to highly skilled scientific and technical manpower. University faculty and students can assist companies with both consultation and research. SIP companies also have access to university training and research facilities such as:

- National Tsinghua University
- National Chiaotung University
- Industrial Technology Research Institute

Cooperation between the SIP and local academic and research institutes makes joint projects possible. One company has established a training program for students at Tsinghua University in exchange for assistance from the school in software development. In another program at Singhua, a company and the SIP are jointly funding a training program for company employees. Chiaotung University's Managerial Information Center runs a training program that is open to SIP company employees. The Industrial Technology Research Institute, one of Taiwan's premier high-technology research centers, has contracted an SIP company to design IC-related products. Joint training and cooperative research projects help keep SIP industries on the cutting edge of new technologies.

Services

A wide range of services are available in the SIP. The Science-Based Industrial Park Administration (SIPA) has six service divisions: Planning and Auditing, Investment Services, Public Relations, Business Services, Construction, and Urban Planning and Management. SIPA also maintains two special service centers for SIP industries: a computer center and a warehouse and transportation center.

SIPA's staff is trained to assist investors. A feedback forum enables investors to offer suggestions about SIP services and operations. An administrative team stands ready at all times to handle urgent investment and business questions. Members of the team see to it that investors receive prompt responses and that administrative policy is modified when appropriate.

Other services managed by the SIP and government agencies include:

- A customs office, a post office, a telecommunications service, and a tax office, all located in a joint-operations zone
- Banking services offered by the International Commercial Bank of China, Bank of Taiwan, and the Bank of Communications

Park utilities supporting the enterprises and services in SIP include a modern power plant, a wastewater treatment plant, and a waterworks. A security force and a fire department help protect the SIP and its residents.

Site Details and Lease Terms

For standard factory sites, the SIP offers an established site with a fully developed and operating infrastructure. Ready-built, multipurpose factory sites are available for investors who wish to set up quickly their operations. The rental rate for standard, 5,500- to 6,000-square-foot buildings is US$0.19 per square foot per month, with a renewable lease period of one to five years. Building and land taxes are included in the rental fee for each site; however, tenants are responsible for paying a small management fee calculated at 0.25 percent of annual sales.

Custom-built factory sites, fully prepared and serviced, are also available for investors who would prefer to construct custom-designed buildings of their own to meet specific needs. Land rental is US$0.019 per square foot per month with a renewable lease period of up to 20 years. Construction costs are generally around US$25 per square foot. In a 10,000-square-foot factory building, air conditioning, a clean room, and compressed air/vacuum pumping facilities can be installed for approximately US$200,000. In the case of custom-built facilities, land taxes are paid by SIPA, but tenants are responsible for a building tax of 0.75 percent of the book value of the factory site.

Residential Facilities

The Hsinchu SIP is set in the hills of north-central Taiwan, not far from Taipei. Hsinchu itself has a country atmosphere. The SIP has large expanses of grass and trees. Housing, education, and recreation facilities are located in the SIP. The SIP offers such services as a minimart, two restaurants, and two cafeterias with a choice of Western or Chinese cuisine.

It features a recreation center, a movie theater, a beauty parlor, a barber shop, and a lounge. Outside there are tennis courts, an artificial lake, a roller-skating rink, and a swimming pool. Other facilities include a health clinic and a community auditorium. Sports and other clubs sponsor a range of activities.

Children of employees living in the park are eligible to attend SIP's experimental school, which offers education from preschool through high school in both English and Mandarin Chinese. The school is staffed by qualified Chinese and foreign teachers who use modern teaching methods.

Rental is calculated on the New Taiwan dollar basis and it has to be adjusted accordingly if the U.S. dollar is used. Land rental is US$0.028 per square foot per month. Modern townhouses, 1,500 square feet in area, are available for families at rental rates of approximately US$450 a month. Apartments of various sizes are also available at monthly rental rates ranging from US$320 to US$900. Single, dorm-style rooms with baths, measuring 170 square feet per unit, are available at US$90 per month.

Investment Incentives

Foreign investments are accorded the same basic incentives as domestic investments by Chinese nationals. Foreign investors may own up to 100 percent of the shares of the enterprises they invest in, or any percentage of shares as agreed upon in a joint venture with local partners.

The Taiwanese government guarantees that any company of which over 45 percent of the shares are held by foreigners or overseas Chinese will not be requisitioned or nationalized for 20 years.

Should a company qualified for operation in the SIP require venture capital, the National Science Council may become its investment partner for up to 49 percent of total shares. The company may, at any time, buy back any or all of the shares held by the government.

Companies eligible to locate in the SIP may obtain low-interest loans to purchase machinery and equipment immediately after completion of registration procedures. The interest rate for such loans is 2 percent lower than the prevailing rate for regular bank loans. The repayment period can be negotiated to begin in the first, second, or third year after commencement of the loan period.

Companies established in the SIP may be eligible for a number of generous fiscal incentives. In the case of new investments, a company may opt for a five-year tax holiday with a four-year deferment of the commencement of the tax holiday, or, for accelerated depreciation of production equipment.

In the case of expansion projects, a company may opt for a four-year tax holiday and four-year deferment for commencement of the tax holiday, or for a 15 percent investment credit against the corporate income tax.

Maximum corporate income tax is 22 percent following the initial tax holiday period. Corporate income tax may be waived for machinery, raw materials, supplies, fuel or partially processed goods imported by any SIP company for its own use. The importer is not required to apply for tax exemption on such goods; however, the importer does have to pay an import duty if the goods are later sold domestically.

No commodity taxes are levied on exported products manufactured by any SIP company. Companies are exempt from a business tax on exported products. Exporters do not have to apply for business tax exemptions, but goods approved for sale on the domestic market are taxed at 5 percent of the add-on value.

Should a company be in a field considered by the SIPA to have strategic applications, it may apply for low-interest financing from the Bank of Communications.

Current construction costs for a standard factory are approximately US$25 per square foot, excluding air-conditioning. However, some custom-designed facilities cost US$80 per square foot for better quality. Also, in checking with IC manufacturers, we learned that the cost of installing a 10,000-square-foot clean room with compressed air/vacuum pumping facilities is about US$2,000,000, instead of US$200,000. In the case of custom-built facilities, land taxes are paid by SIPA, but tenants are responsible for a building tax of 3 percent of the book value of the factory site.

Additional incentives are available for certain SIP companies. Companies planning innovative R&D projects may be eligible to receive government grants. Should a company be in a field considered by the SIPA to have strategic applications, it may apply for low-interest financing from the Executive Yuan Development Fund. SIP also invites distinguished specialists to conduct management seminars for SIP-based entrepreneurs. In addition to providing management training, government-financed experts help introduce pioneering technology in semiconductor manufacturing and other fields to SIP companies.

Finally, in accordance with the Statute for Investment by Foreign Nationals, a company making an investment in the SIP is entitled to repatriate profit and capital in the case of a transfer of shares or a decrease of capital. Under this provision, earnings can be repatriated at a rate of 100 percent. In the case of liquidation of an investment or a decrease in capital, 100 percent of the foreign investor's capital may be repatriated annually.

Application Procedures for SIP

Admission to the Science-Based Industrial Park and the criteria for granting leases are determined by the SIP's governing board. Industries now operating in the SIP include:

- Information and automation
- Telecommunications
- Electronics
- Precision instruments
- Materials science
- Biochemical engineering

To receive the benefits and special incentives that result from being accepted as an SIP company, an investor must submit an investment application to the SIPA for approval. Applications are generally processed in four to six weeks. Approval for applications that involve a joint venture with the government takes about two months.

- Science-Based Industrial Park Administration
  2 Hsin Ann Road, Hsinchu
  Taiwan, R.O.C.
  Tel: (035) 773311, 773377
  Fax: 886-35-77622

- CCNAA, Science Division
  444 Castro Street
  Suite 1214
  Mountain View, CA 94041
  Tel: (415) 969-6688
  Fax: (415) 969-6478

- CCNAA, Science Division
  3660 Wilshire Boulevard
  Suite 1034
  Los Angeles, CA 90010
  Tel: (213) 387-8091, 387-8095
  Fax: (213) 380-9240

- CCNAA, Science Division
  4301 Connecticut Avenue, N.W.
  Suite 132
  Washington, D.C. 20008
  Tel: (202) 895-1930
  Fax: (202) 895-1939

- CCNAA, Science Division
  11 Greenway Plaza
  Suite 1412, Summit Tower
  Houston, TX 77046
  Tel: (713) 963-9433, 963-9434
  Fax: (713) 622-4269

COMPANIES LOCATED IN THE HSINCHU SIP

- Semiconductors
  - Advanced Devices Technology, Inc.
  - Advanced Microelectronics Products Taiwan, Inc.
  - Episil Technologies, Inc.
  - Getmore Precision Co. Ltd.
  - Hualon Microelectronics Corp.
  - Kest Systems & Services Co., Ltd.
  - Mosel Electronics Corp. R.O.C.
  - OPTO Tech. Corp.
  - QUASEL Taiwan Co., Ltd.
  - Silicon Integrated System Corp.
  - Sino-American Silicon Products, Inc.
  - Syntek Design Technology Co., Ltd.
  - Taiwan Hi-tech Corp.
  - Taiwan Semiconductor Manufacturing Co., Ltd.
  - Talent Electronics Corp.
  - United Microelectronics Corp.
  - Util Corp., Taiwan
  - Vate Technology Co., Ltd.

- Vitelic Taiwan Corp.
- Winbond Electronics Corp.

• Computers and Peripherals

- Accton Technology Corp.
- Acer Incorporated
- AMP Manufacturing Taiwan, Co., Ltd.
- AST Taiwan Co., Ltd.
- Behavior Design Corp.
- CIS Technology, Inc.
- CMT Taiwan Inc.
- Datex System Systems Inc.
- Dotronix Taiwan Co., Ltd.
- Eaton Limited
- ECAD Far East, Inc.
- Ecord Technology Industry Co.
- Fontex Technology Corp.
- Hsin Yuan Electronics Co., Ltd.
- Key Tronic (Taiwan) Corp.
- Logitech Far East, Ltd.
- Microscience International Taiwan Co., Ltd.
- Microtek International Corp.
- Mitac International Corp.
- Multitech Industrial Corp.
- Neotech Development Corp.
- OEMTEK Taiwan, Inc.

- Priam Taiwan Co., Ltd.
- Primages, Inc.
- Qume Corporation Taiwan
- Taiwan Media Technology, Inc.
- Tomas & Betts Industries Co., Ltd.
- Umax Data Systems Inc.
- Visionetics Inc.
- Wang Computer (Taiwan), Ltd.

• Telecommunications

- AT&T Taiwan Telecommunications Co., Ltd.
- Central Electronics and Telecommunications Corp.
- Chitectronics Corp.
- Chung-Hwa Communication Co., Ltd.
- E-Tech Inc.
- Huawell Electronic-Optics Co. Ltd.
- Landis & Gyr-Sinstar Co., Ltd
- Lightspeed Technology Inc.
- Link Communications Taiwan, Inc.
- Microelectronics Technology Corp.
- Quartz Frequency Technology Co., Ltd.
- Southern Information System, Inc.
- Tecom Co., Ltd.
- Terico Ltd.
- United Fiber Optic Communication, Inc.
- Varian Taiwan Co., Ltd.

High-Technology Zones--Taiwan

- Electro-Optical
  - Advanced Technological Taiwan Corp.
  - Compact Disc Industries Co. Ltd.
  - K Laser Technology, Inc.
  - Melles Griot KY, Ltd.
  - Philips Optoelectronic Devices (Taiwan) Ltd.
  - Opto Tech. Corp.
  - Oxlex Corp. (Taiwan) Ltd.
  - Taiwan Electro Optical System
  - Tyntek Corporation
- Automation
  - Applied Mechtronics Co., Ltd.
  - Flow Fareast Co., Ltd.
  - Kastmaster Intl., Inc.
  - Mototech International Corp.
  - Myotoku Co., Ltd.
  - Princo Corp.
  - Scientech Automation Corp.
- Biotechnology
  - Applied Science Corp.
  - Evernew Biotech, Inc.
  - General Biologicals, Inc.
  - Lifeguard Pharmaceutical, Inc.

High-Technology Zones--Taiwan

- Environment
  - Micropore Inc.
- Energy
  - Sinonar Corp.

High-Technology Zones--Hong Kong

INDUSTRIAL TOWNS AND ZONES

Hong Kong's government has developed new towns that are self-contained communities providing housing, employment, schools, shopping, and community facilities. Table 1 provides details on these areas, including approximate selling and rental prices for industrial facilities.

Tsuen Wan New Town is about 9.3 miles from Kowloon. The township includes the adjacent area of Kwai Chung--with its modern container terminal--and Tsing Yi Island, which is connected to the mainland by a road bridge. A second linking road bridge will be completed in 1987. There are about 10,980 factories in the area producing a wide range of consumer goods and other light industrial products. Tsuen Wan's population of about 700,000 is predicted to be about one million by 1993.

Tsing Yi Island accommodates mostly medium to heavy industries. Those already established make cement, corrugated paper, marine outboard engines, polystyrene, and boats. Ship and oil rig repairing are also important, and a number of large dockyards have been built.

Tuen Mun New Town is about 20 miles from Kowloon. A six-lane highway between Tuen Mun and Tsuen Wan reduces traveling time between the two towns to 25 minutes.

Currently the home of over 200,000 people, Tuen Mun, when fully developed, will house more than 500,000 people and provide 158 hectares of industrial sites. Some of this area is for heavier and land-intensive industries, providing a more balanced and integrated economic structure and better prospects for skilled workers. About 1,490 factories have already been established in Tuen Mun, including a zipper factory, a large toy factory, a dairy, and a heat-transfer printing paper plant.

Sha Tin is 8.7 miles from Kowloon and is on the Kowloon-Canton Railway. At present accommodating 250,000, Sha Tin will have a population of over 800,000 when fully developed and provide 60 hectares of light industrial sites in three main districts. About 1,170 factories have already been established in Sha Tin.

Kwun Tong, a district within the urban area, is situated about 6.2 miles from the southern tip of Kowloon and 3.1 miles from the airport. It is served by a major trunk road, underground railway, and both passenger and vehicular ferries to Hong Kong Island. There are 5,600 factories in Kwun Tong engaged mainly in textiles, electronics, electrical, plastics, metalware, rubber, paper, and light machinery industries. Ample labor supply is ensured by its population of over 600,000 living in nearby public housing estates.

Other well-established industrial areas include Aberdeen/Wong Chuk Hang and Chai Wan on Hong Kong Island, and San Po Kong and Cheung Sha Wan in Kowloon. Over 11,000 factories are established in these areas.

Table 1

INDUSTRIAL TOWNS AND ZONES--HONG KONG

			Industrial Premises			
			Approximate Selling Price per Square Meter		Approximate Monthly Rental Price per Square Meter	
District	Labor Force	Number of Manufacturing Establishments	Ground Floor	Upper Floor	Ground Floor	Upper Floor
Chai Wan/Shau Kei Wan	99,800	1,550	HK$6,000-HK$8,000 US$769-US$1,026	HK$3,000-HK$4,000 US$385-US$513	HK$50-HK$70 US$6-US$9	HK$30-HK$40 US$4-US$9
Wong Chuk Hang/ Aberdeen	95,400	960	HK$8,000-HK$9,000 US$1,026-US$1,154	HK$3,500-HK$5,000 US$449-US$641	HK$70-HK$80 US$9-US$10	HK$30-HK$45 US$4-US$6
Cheung Sha Wan/ Lai Chi Kok	184,300	6,010	HK$9,000-HK$10,000 US$1,154-US$1,283	HK$4,000-HK$5,000 US$513-US$641	HK$80-HK$90 US$10-US$12	HK$35-HK$45 US$4-US$6
Kwun Tong/San Po Kong	561,300	9,800	HK$6,000-HK$8,000 US$769-US$1,026	HK$3,500-HK$4,500 US$449-US$577	HK$50-HK$70 US$6-US$9	HK$30-HK$40 US$4-US$5
Tuen Wan	293,300	10,980	HK$5,500-HK$7,000 US$705-US$897	HK$2,500-HK$4,000 US$321-US$513	HK$50-HK$60 US$6-US$8	HK$20-HK$35 US$3-US$4
Tsuen Mun	35,300	1,490	HK$3,000-HK$4,500 US$385-US$577	HK$1,500-HK$2,500 US$192-US$321	HK$30-HK$40 US$4-US$5	HK$15-HK$25 US$2-US$3
Sha Tin	49,700	1,170	HK$4,500-HK$6,000 US$577-US$769	HK$2,500-HK$3,500 US$321-US$449	HK$40-HK$55 US$5-US$7	HK$20-HK$30 US$3-US$4

Source: Dataquest
March 1987

High-Technology Zones--Singapore

SINGAPORE SCIENCE PARK (SSP)

The Singapore Science Park (SSP) is developed and managed by the Jurong Town Corporation. Routine administration and promotion are handled by the Science Council of Singapore and the Economic Development Board. Adjacent to the National University of Singapore, the SSP is established to accommodate pure R&D organizations as well as R&D activities relating to the manufacture of high-technology products.

The first private-sector tenant, the Marine Technology Centre of Det Norske Veritas, became operational in late 1983. Several Starter Unit tenants, including Austek Microsystems, Robin Electronics, Robot Leasing and Consultancy, Scientech-Intraco, and Seagate Technology, began their R&D operations in SSP in 1984. Companies that have set up R&D operations at the Park since 1984 include Diagnostic Biotechnology, Mentor Graphics, Plantek International, Tata-Elxsi from the United States; Takasago from Japan; and Singaporean firms Automation Applications Center and Radan Systems.

At the latest count, 16 companies or organizations had been admitted to the Park. The 13 companies currently operating have a combined total of 155 employees. The Jurong Town Corporation is continuing to provide new facilities for new tenants.

Also located in SSP is the Science Council of Singapore, the government agency that promotes science, technology, and R&D. The Science Council administers both the SSP and the government Research and Development Assistance Scheme (discussed later). The Science Council's role is to facilitate communications between SSP tenants and tertiary institutions and the Singapore government.

The SSP has been developed in four phases. Phases I and II occupy 50 hectares (123.5 acres); Phases III and IV occupy 65 hectares (160.6 acres). Currently, Phase I is fully occupied, and Phase II is about 15 percent occupied.

The SSP is situated next to the National University of Singapore and the Institute of Systems Science. Nearby are other technical institutions of higher learning such as Nanyang Technological Institute and Singapore Polytechnic, among others. Also nearby are the central district of Singapore and the Singapore Changi International Airport.

In the SSP are the facilities of the National Computer Board and the Singapore Institute of Standards and Industrial Research. A computer center, science and engineering libraries, telecommunications, postal services, and other support services are available in the Park and at the National University of Singapore.

Situated in one of the SSP's ready-built starter units is the Innovation Centre. This facility is subdivided into small individual units designed for local investors, small R&D companies, and consulting firms. As is true of the SSP in general, the Centre is serviced and administered by the Science Council of Singapore.

Incentives

No special explicit incentive measures are available to SSP tenants, but the same investment incentives that prevail throughout Singapore are available to them. Two government R&D promotion schemes that may be of particular interest to tenants are described below.

Research and Development Assistance Scheme

The S$50 million (which equals US$23.9 million at S$2.09/US$1.00 throughout this section) Research and Development Assistance Scheme fund provides financial assistance to major R&D projects it deems to be of national importance and technological significance. Private sector companies and public agencies are eligible to apply for funding, which covers up to 100 percent of approved direct project costs. The focus of the scheme is on infrastructure building, technical innovation, and training of the local research staff. Generally, projects eligible for grants require one to five years to complete. No maximum limit is set on grant value.

Product Development Assistance Scheme

The Product Development Assistance Scheme is set up as a means to develop local applied research and product development capability and to enhance indigenous technology. Its intent is to encourage local companies to develop new products and processes or improve existing ones.

Grants under this scheme will be used for product or process development work carried out in house or through outside agencies. Where foreign consultants are engaged, the cost will be supported only if there is close collaboration with local engineers and scientists to effect technology transfer.

Singapore companies with majority shareholding by Singapore citizens or permanent residents are eligible to receive grants under this program. Proposed development projects should preferably be closely related to an applicant's existing manufacturing activities and should involve substantial technical improvements to the products or processes, not merely cosmetic changes in product design.

The scheme provides grants equal to 50 percent of approved direct development costs of an approved project, including labor, equipment, materials, consulting, and utilities. For grants exceeding S$50,000 (US$23,900), an external auditor's certification is required.

Admissions

Admission to the SSP and the criteria for grant of leases is determined by the Science Park Admissions Committee. Generally speaking, all nonpolluting scientific and industrial R&D activities that are not land-intensive are welcomed. Desirable operations include:

- Advanced Electronics Development—Computers and peripherals, communications equipment, IC design and fabrication, microprocessor applications, computer software development, artificial intelligence research
- Product Test and Analysis Services—Product performance and reliability testing, device failure analysis, materials testing, product and process development
- Medical and Scientific Instruments Development—Specialized medical products, electromedical instruments, scanners, analytical instruments, artificial organs
- Biotechnology R&D—Genetic engineering, plant and food research, waste treatment, antibiotics and vaccines, cancer drugs, diagnostic kits
- Industrial Robots and Automation Equipment Development—Robotics, special-purpose machines, microprocessor-based control systems, automatic insertion machinery, flexible manufacturing systems
- Optical and Laser Technology—Design and development of new systems and materials, holography, laser medical applications, fiber-optic communications
- Chemical and Plastics R&D—Biochemicals, fine chemicals, pharmaceuticals, polymers

Application Procedure

Written applications for the SSP must be submitted to any of the following:

- Science Council of Singapore
63, Block 1 Science Park Drive
Singapore 0511
Telephone: 7797066
Telex: RS 39055 SCICO
Fax: 7771711

- Singapore Economic Development Board
  1 Maritime Square #1040
  World Trade Center (Lobby D)
  Singapore 0409
  Telephone: 2710844
  Cable: INDUSPROMO
  Telex: RS 26233
  Fax: 2710844
  (or any of the Board's worldwide offices)

- Jurong Town Corporation
  Jurong Town Hall
  Singapore 2260
  Telephone: 5600056
  Cable: JUTOWN
  Telex: RS 35733
  Fax: 5655301All

Park admission applications are submitted to the Science Council secretariat for review and allocation by the Science Park Admissions Committee.

Land Leases

Fully prepared and serviced sites are available for R&D organizations that prefer to construct their own buildings to suit their specific requirements, as long as they do not exceed the Park's land-use and height restrictions. Thirty- to sixty-year leases are available for these sites.

Starter Units

Ready-built starter units designed for flexibility of use are also available on a rental basis. These units are suitable for a variety of advanced technological activities and are leased for three-year periods with a renewal option for additional three-year terms.

High-Technology Zones--China

CAOHEJING MICROELECTRONIC INDUSTRIAL PARK

The Caohejing Microelectronic Industrial Park contains facilities chiefly for the development of microelectronics technology including computers, large-scale integrated circuits, optical fiber communications, lasers, and robots. It is situated in Shanghai and covers 170 hectares.

Recently built around the industrial park were a 220-kV transformer substation, a 20,000-line telephone exchange, a waterworks, a gasholder plant, and a sewage treatment plant.

The foundation-stone laying ceremony for the park was held September 26, 1986. The first phase of the project includes mainly the building of infrastructure (roads, bridges, drainage, water, electric, gas, and telecommunications systems), and the building of factories and research institutions. Under the plan, relatively concentrated living facilities and an administrative center will be set up simultaneously in the industrial park. Service facilities in the park will include banking, insurance, epidemic prevention, customs, commodity inspection, and product displays catering to foreigners.

The Shanghai Caohejing Microelectronic Industrial Park Development Corporation has been authorized by the Shanghai municipal government to develop and manage the industrial park, and to provide consultancy and agency services for absorbing overseas funds and technology in the park. The corporation's address is 1446 Xietu Road, Shanghai (cable: 7014 Shanghai; telephone: 315919).

ZHONGGUANCUN, BEIJING

Zhongguancun, a northwestern district of Beijing, is another high-tech zone in China. Beijing University, Qinghua University, and several state-run research academies are among those in the district. Right now, there are about 100 high-tech companies operating in the area, developing and marketing computer, electronic, chemical, and biotechnology products. Most are directly under or connected to the Academy of Sciences, although about one-third of the businesses, primarily smaller enterprises involving only sales, are privately run.

Corporate R&D

Corporate R&D--South Korea

INTRODUCTION

Native-owned South Korean semiconductor manufacturers and their products are listed in Table 1. The Group A companies shown in Table 1 are the major forces in South Korea's penetration of the worldwide market. The Group B companies participate in the semiconductor business primarily through manufacture of discrete devices and/or through assembly and packaging activities. This section focuses on the major Chaebol, or giant companies, as their activities are of primary interest and significance in South Korea's efforts to establish an internationally competitive, indigenous semiconductor industry incorporating leading-edge technology. Unless otherwise specified, in-text currency references are to U.S. dollars.

Table 1

Native-Owned Semiconductor Manufacturers—South Korea

Group A

Company	Products
Goldstar Electron Co., Ltd.	Bipolar digital--LSTTL Bipolar linear--audio, video, industrial ICs MOS memory--16K SRAM, 64K SRAM, 1M ROM, 64K EPROM, 256K DRAM, 1M DRAM MOS MPU--Z80 family ASIC--CMOS gate arrays, semicustom, standard cell Hybrid ICs--thin film
Samsung Semiconductor and Telecommunications Co., Ltd.	Bipolar linear--audio, video, industrial, telecom and consumer ICs MOS logic--CMOS watch and calculator chips, HC/TTL, ACT/TTL MOS memory--64K DRAM, 256K DRAM, 1M DRAM 64K SRAM, 256K SRAM, 16K, 64K, and 256K EEPROM MOS MPU--4-bit MCU and MPR, 8-bit MCU, and MPR Transistors--S/S, power, MOSFET ASIC--gate arrays, linear arrays, standard cell, full custom

(Continued)

Table 1 (Continued)

Native-Owned Semiconductor Manufacturers—South Korea

Group A (Continued)

Company	Products
Hyundai Electronics Industries Co., Ltd.	MOS memory--16K, 64K, and 256K SRAM, 1K EEPROM, 64K EPROM, 64K DRAM, 256K DRAM, 1M DRAM, PLDs ASIC--Gate arrays
Daewoo Telecommunications Co., Ltd.	Bipolar linear--audio and video ICs, MOS consumer--ICs for PCs and telecommunications ASIC--standard cell
Korea Electronics Co., Ltd.	Bipolar linear--audio and video circuits, transistors, diodes, LEDs

Group B

Dung Sung Moolsan Ind. Co., Ltd.	Diodes, rectifiers, varistors
Korea Diode Co., Ltd.	Silicon rectifiers, bridge diodes
Korea Optoelectronics Corp.	Transistors, diodes, solar cells, photo Darlingtons, photo couplers, photo interrupters

Source: Dataquest
September 1989

South Korean semiconductor investment increased dramatically in 1983 when the government launched the Semiconductor Industry Fostering Plan. This plan provided more than $300 million for loans to domestic companies from 1984 to 1987. The major beneficiaries of this financial support are Samsung, Goldstar, and Hyundai. Heated competition among these conglomerates pushed investments higher than original plans, and additional funds were obtained from international financial markets. Since the beginning of 1983, these three Chaebol have invested more than $1 billion in semiconductor technology. More than 90 percent of the total investments have been financed by external debt.

Corporate R&D--South Korea

MAJOR SEMICONDUCTOR OPERATIONS

Goldstar Semiconductor, Ltd.

The Lucky-Goldstar Group is a $20.5 billion company that makes products ranging from toothpaste to apparel, elevators to microwave ovens, electronic switching systems to computers and ICs. The Goldstar Company, a subsidiary of the Group, is the second largest electronics company in South Korea, with 1988 revenue of approximately $3.9 billion. It is a major producer of color televisions, videocassette recorders, microwave ovens, monitors, PCs, and terminals. The company is extending its product line to include high-technology items; consequently, it now manufactures minicomputers and mainframes. The Goldstar Company has a factory in Huntsville, Alabama, where it makes one million color televisions per year, in addition to microwave ovens and refrigerators, all for the North American market.

The Group's subsidiary, Goldstar Electron Co., was established in August 1989 with paid-in capital of W300 million. The Group's semiconductor business, which is divided by Goldstar Co. and Goldstar Semiconductor, Ltd., will be merged into the new company. As of August 1, Goldstar's Woomyun R&D facility and Chongju plant were moved to Goldstar Electron and Goldstar Semiconductor's Gumi plant will be moved to the new subsidiary at the end of this year, after finishing discussions with AT&T.

By merging Lucky-Goldstar's semiconductor business into Goldstar Electron Co., Goldstar Electron is expecting many advantages such as cooperation and fast decision making. Goldstar Electron will continue investing in semiconductors as the previous two companies did.

Samsung Electronics Co., Ltd.

The Samsung Group is the largest conglomerate in South Korea with 26 affiliated companies and sales of $30.1 billion in 1988. Samsung has its strength in electronics products with five electronics-related affiliates. Overall, the electronics sector currently generates one-fifth of the group's total revenue.

Its major electronics affiliate, the Samsung Electronics Company, is the leading South Korean electronics manufacturer, with 1988 sales of approximately $4.1 billion. By merging the Samsung Semiconductor & Telecom (SST) into Samsung Electronics Co., Ltd., last November, 1988, the company's leading position in the South Korean electronics industry has been strengthened.

In semiconductors, the company licensed Micron Technology's 64K and 256K DRAMs, and entered into a joint development pact with Exel to develop the 2816A 16K EEPROM. Further, it's recent license from Intel gave the company the right to make and sell microprocessor products in South Korea. All technology agreements are listed in <u>Company Profiles</u> (Volume III).

Corporate R&D--South Korea

In 1974, Samsung acquired a fab facility in Buchon that enabled the company to manufacture ICs. Its $125 million fab facility in Kiheung, south of Seoul, has a capacity of 35,000 4-inch wafers per month with 3-micron capability. Samsung added a 6-inch fab, which had a capacity of 20,000 wafers per month, with all steppers for VLSI production in 1985 and increased the capacity to 35,000 wafers per month in 1987.

Samsung Semiconductor, Inc., in Santa Clara, California, is a U.S. subsidiary of Samsung Electron Co., Ltd. Established in 1983, the Santa Clara facility houses a 5,000-square-foot pilot line, with 5-inch, 2-micron capability. The company is Samsung Electron Company's U.S. arm for sales, marketing, design, and application engineering. Product definition, development, and process debugging are performed in the Santa Clara facility before the designs are transferred back to South Korea for volume production.

Hyundai Electronics Industries Co., Ltd.

Hyundai is South Korea's second largest Chaebol with sales of approximately $27.4 billion in 1989. Hyundai's main business lines are automobiles, shipbuilding, and construction. Hyundai was the last of the Big Four to enter electronics. The company gained electronics assembly experience through its subcontract with Faraday (PC add-on boards) and Novatel (cellular telephones).

Hyundai Electronics was established in 1983. In addition to semiconductors, Hyundai entered the areas of telecommunications, office automation, and information systems. The company has contracted a second-source agreement with International CMOS Technologies (ICT) for EEPROM technology, Inmos for 256K DRAMs, and Vitelic for 256K DRAMs, SRAMs, and 1Mb DRAMs.

Hyundai established a U.S. subsidiary, Hyundai Electronics America (HEA), in Santa Clara, California. HEA originally devoted most of its 100,000-square-foot complex to semiconductors. The facility contains an 11,000-square-foot wafer fab facility designed to run CMOS on 5-inch wafers with 2-micron design rules. HEA's manufacturing operations were shut down during 1985, and the company sold the fab facility to Siemens in 1986. HEA continues with marketing activities in the United States.

Strong sales of DRAMs and SRAMs accounted for revenue of $210 million in Hyundai's memory sector, a great jump from the previous year. It expects equally strong growth in its mega-DRAM line, which is due to come on-line this November.

Daewoo Telecommunications Co., Ltd.

The primary business lines of Daewoo, a $20.5 billion conglomerate, are shipbuilding, international trade, machinery, construction, automobiles, oil, and consumer electronics. Daewoo has PC subcontracts with Leading Edge and Cordata Systems, a computer license with Burroughs, and a joint venture on customized ICs and communication equipment with Northern Telecom. The group's subsidiary, Daewoo Telecom, is one of the four Korean companies picked to modernize South Korea's rural telephone system.

Daewoo Semiconductor is a division of Daewoo Telecommunications. It was established in June 1984. Daewoo's U.S. operations are headquartered in the Silicon Valley in California, at its subsidiary, ID Focus. ID Focus is currently doing market research to develop designs for the electronics and telecommunications divisions of Daewoo. Daewoo does not directly operate a semiconductor facility in the United States, but it has acquired controlling interest of ZyMos in Sunnyvale, California, which it intends to use as its technology source.

Korea Electronics Co., Ltd.

Korea Electronics Co., (KEC) was established in September 1969, under a joint venture with Toshiba Co. of Japan (South Korea, 30 percent; Toshiba, 70 percent). At that time, the company name was Toshiba Korea Co. In 1979, when the company became public, the ownership was changed to 90 percent South Korea, 10 percent Toshiba. The current company name was adopted in March 1974. The company's major products are black-and-white and color television sets, monitors, and semiconductors, mainly bipolar linear and discrete. Total semiconductor sales were $14.7 million in 1982 and an estimated $100.0 million in 1988.

PLANT LOCATIONS

South Korean semiconductor manufacturing is concentrated in two areas: Seoul in the northwest portion of the country, and Gumi in the southeast.

The 1988 wafer production capacity of selected South Korean manufacturers is shown in Table 2. The production capacity of these companies is estimated at 413,000 wafer starts per month, with the majority of this capacity added during the 1980s. South Korean production capacity by wafer size is shown in Table 3. Facilities designed to run 4-inch wafers account for 29.8 percent of total slices. Five-inch wafer fab lines account for 17.7 percent of capacity, while state-of-the-art 6-inch facilities account for 52.5 percent.

Table 2

Wafer Production Capacity of Selected Manufacturers—South Korea
(1988)

	Plant	Wafer Size	Wafer Starts (average per month)
Samsung	Buchon	4-inch	25,000
		5-inch	20,000
	Kiheung	4-inch	35,000
		6-inch	95,000
Goldstar	Gumi	4-inch	25,000
		5-inch	15,000
	Anyang	5-inch	10,000
	Woomyun	6-inch	12,000
	Chongiu	6-inch	45,000
KEC	Gumi	4-inch	20,000
		5-inch	5,000
Hyundai	Ichon	5-inch	23,000
		6-inch	65,000
Daewoo	Goonpo-eup	4-inch	18,000

Source: Dataquest
September 1989

Table 3

Production Capacity by Wafer Size—South Korea
(1988)

Wafer Size	3-Inch	4-Inch	5-Inch	6-Inch	Total
Capacity in Average Wafer Starts/Month	0	123,000	73,000	217,000	413,000
Percent of Total	0	29.8%	17.7%	52.5%	100%

Source: Dataquest
September 1989

NATIVE-OWNED SEMICONDUCTOR PRODUCTION

Total semiconductor revenue of the four major manufacturers (Samsung, Goldstar, KEC, and Hyundai) is shown in Table 4. Revenue grew at an estimated cumulative annual rate of 85.6 percent, from $114.0 million in 1983 to $635.4 million in 1988. Total IC growth over the period was dramatic at 121.5 percent, as these manufacturers rapidly came on-line with production facilities able to produce leading-edge circuits. The IC manufacturing base of these companies supported only $51.0 million of IC production in 1984, but leaped to an estimated $1,228.0 million in 1988.

Table 4

Semiconductor Revenue of Samsung, Goldstar, KEC, and Hyundai (Millions of U.S. Dollars)

	1984	1985	1986	1987	1988	CAGR 1984-1988
Total Semiconductor	$114.0	$174.8	$299.1	$513.2	$1,354.0	85.6%
IC	51.0	117.8	229.1	418.3	1,228.0	121.5%
Bipolar Digital	1.5	7.3	14.4	21.1	32.0	114.9%
MOS	26.5	65.0	158.3	302.0	1,040.0	150.3%
Linear	23.0	45.5	56.4	95.2	156.0	61.4%
Discrete	60.0	55.0	67.7	91.9	121.0	19.2%
Optoelectronic	3.0	2.0	2.3	3.0	5.0	13.6%

Source: Dataquest
September 1989

Semiconductor revenue for the top four manufacturers (by company and product category) is presented in Table 5. Samsung, Goldstar, and Hyundai each demonstrated growth rates in excess of 17.0 percent from 1984 to 1988. These three manufacturers are heavily committed to developing their semiconductor manufacturing capability and have invested large amounts of capital to this end. KEC's revenue growth, 26 percent, is less than that of Samsung and Goldstar. KEC has participated at a lower level in the rush to develop capacity.

Table 5

Semiconductor Revenue of Samsung, Goldstar, KEC, and Hyundai
by Company
(Millions of U.S. Dollars)

	1984	1985	1986	1987	1988	1990*	CAGR 1984-1988
Samsung							
Total Semiconductor	$60.0	$95.0	$170.0	$327.3	$905.0	$1,170.0	97.1%
IC	33.0	75.0	144.3	281.2	850.0	1,600.0	125.3%
Bipolar Digital	0	0	0	0	0	0	0
MOS	25.0	55.0	117.4	242.2	765.0	1,450.0	135.2%
Linear	8.0	20.0	26.9	48.0	85.0	150.0	80.5%
Discrete	27.0	20.0	25.7	36.1	55.0	100.0	19.5%
Optoelectronic	0	0	0	0	0	0	0
Goldstar							
Total Semiconductor	$16.0	$32.8	$ 48.2	$ 67.9	$137.0	$ 250.0	71.1%
IC	13.0	29.8	47.5	67.1	136.0	250.0	79.8%
Bipolar Digital	1.5	7.3	13.3	21.1	32.0	40.0	114.9%
MOS	1.5	5.0	4.6	19.8	63.0	150.0	154.6%
Linear	10.0	17.5	29.6	26.2	41.0	60.0	42.3%
Discrete	3.0	3.0	0.7	0.7	1.0	0	(24.0%)
Optoelectronic	0	0	0	0	0	0	0
Korea Electronics							
Total Semiconductor	$38.0	$42.0	$ 50.3	$ 78.0	$ 95.0	$ 160.0	25.7%
IC	5.0	8.0	10.0	20.0	25.0	45.0	49.5%
Bipolar Digital	0	0	0	0	0	0	0
MOS	0	0	0	0	0	0	0
Linear	5.0	8.0	10.0	20.0	25.0	45.0	49.5%
Discrete	30.0	32.0	38.0	55.0	65.0	110.0	21.3%
Optoelectronic	3.0	2.0	2.3	3.0	5.0	5.0	13.6%
Hyundai Electronics							
Total Semiconductor	-	$ 5.0	$ 21.0	40.0	$210.0	$ 410.0	250.0%
IC	-	5.0	21.0	40.0	210.0	410.0	250.0%
Bipolar Digital	-	0	0	0	0	0	0
MOS	-	5.0	21.0	40.0	210.0	410.0	250.0%
Linear	-	0	0	0	0	0	0
Discrete	-	0	0	0	0	0	0
Optoelectronic	-	0	0	0	0	0	0

*Estimated

Source: Dataquest
September 1989

JOINT VENTURES AND LICENSE AGREEMENTS

Semiconductors are the common denominator in South Korea's efforts to develop high-technology manufacturing. Compared with their American and Japanese counterparts, South Korean companies are playing catch-up from a very late start; however, they are very aggressive and ambitious. The combination of government and industry focus and support is yielding the same dramatic results as Japan's entry into semiconductor production during the 1970s. Furthermore, the South Koreans are trying to accomplish in 5 years what it took the Japanese 20 years to develop: a self-sufficient semiconductor industry. This much-reduced timetable would not be feasible without the formation of alliances. Unlike Japan, South Korea welcomes alliances and foreign ownership.

A foreign technology agreement enables South Korean manufacturers to move ahead more rapidly in developing an indigenous semiconductor industry than purely internal development would allow. The rapidity with which alliances are being formed is startling. In the span of only two years, from 1983 to 1985, four native South Korean semiconductor manufacturers have entered into more than 20 technology and production alliances.

CAPITAL SPENDING

In their efforts to become full-fledged participants in the worldwide semiconductor industry, South Korean manufacturers are investing heavily in R&D and semiconductor manufacturing capability. Semiconductor-related capital spending for the top four companies is presented in Table 6.

Total South Korean capital spending in 1984 was $463 million. In 1985, the $499 million capital spending figure was slightly higher than the 1984 figure. Because most of the factories and R&D programs initiated by the major industry and government push in 1983 came on-stream in 1984 and 1985, investment is expected to taper off in coming years. Total 1986 spending was estimated to be $328 million, while 1987 spending was estimated to be $397 million.

The establishment of production facilities accounted for the major 1984 share of capital spending at $421 million, or 91 percent of total dollar investment. R&D expenditure as a share of total spending was anticipated to increase from 7 percent in 1984 to 20 percent in 1987. Nineteen eighty-eight was another banner year for semiconductor equipment investment in South Korea. It was less than $500 million in the past three to four years, but it almost doubled in 1988. South Korea is facing its second wave of capacity expansion since the 1984 and 1985 time frame. A description of the R&D facilities established by the Big Four manufacturers is given in Table 7.

Corporate R&D--South Korea

Table 6

Estimated Semiconductor-Related Capital Spending—South Korea (Millions of U.S. Dollars)

	1984	1985	1986	1987	1988	1989*
Facilities	$421	$429	$275	$304	$593	$1,390
Samsung	160	180	120	120	332	410
Hyundai	131	129	37	35	20	380
Goldstar	96	100	80	89	200	500
KEC	34	20	17	5	14	50
Daewoo	-	-	21	55	27	20
Kukje	-	-	-	-	-	30
R&D	$ 42	$ 70	$ 53	$ 93	$165	$ 210
Samsung	16	40	30	10	109	50
Hyundai	7	12	6	36	9	30
Goldstar	16	7	10	36	45	115
KEC	3	2	3	1	2	10
Daewoo	-	-	4	10	0	5
Total Investment	$463	$499	$328	$397	$758	$1,600

*Estimated

Source: Dataquest
September 1989

Table 7

Research and Development Facilities—South Korea (1988)

Company	Location	Year Established	Employees	Floor Space (m^2)
Samsung	Buchon	1981	150	1,000
Samsung	Kiheung	1985	430	8,500
Goldstar	Anyang	1984	400	3,300
KEC	Gumi	1984	120	1,300
Hyundai	Ichon	1984	58	1,300
Daewoo	Seoul	1986	40	1,000

Source: Dataquest
September 1989

Corporate R&D--South Korea

INTRODUCTION

Native-owned South Korean semiconductor manufacturers and their products are listed in Table 1. The Group A companies shown in Table 1 are the major forces in South Korea's penetration of the worldwide market. The Group B companies participate in the semiconductor business primarily through manufacture of discrete devices and/or through assembly and packaging activities. This section focuses on the major Chaebol, or giant companies, as their activities are of primary interest and significance in South Korea's efforts to establish an internationally competitive, indigenous semiconductor industry incorporating leading-edge technology. Unless otherwise specified, in-text currency references are to U.S. dollars.

Table 1

Native-Owned Semiconductor Manufacturers—South Korea

Group A

Company	Products
Gold Star Semiconductor, Ltd.	Bipolar digital--STTL, LSTTL, modems, telephone ICs Bipolar linear--audio, video, industrial ICs MOS memory--64K DRAM, 64K SRAM, 1M ROM, 64K EPROM, 256K DRAM, 1M DRAM MOS MPU--Z80 family ASIC--CMOS gate arrays, semicustom, standard cell Hybrid ICs--thick film Transistors--low-power high-speed, medium-power SCR/TRIAC
Samsung Semiconductor and Telecommunications Co., Ltd.	Bipolar linear--audio, video, industrial, telecom and consumer ICs MOS logic--watch and calculator chips, HC/TTL, LS/TTL, ACT/TTL MOS memory--64K DRAM, 256K DRAM, 1M DRAM 256K SRAM, 64K SRAM, 16K and 64K EEPROM MOS MPU--4-bit MPU, MPR Transistors--S/S, power, MOSFET ASIC--gate arrays, linear arrays, standard cell, full custom, PLDs

(Continued)

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Table 1 (Continued)

Native-Owned Semiconductor Manufacturers—South Korea

Group A (Continued)

Company	Products
Hyundai Electronics Industries Co., Ltd.	MOS memory--16K and 64K SRAM, 128K and 256K ROM, 1K EEPROM, 64K EPROM, 64K DRAM, 256K DRAM, 1M DRAM MOS MPU--8- and 16-bit ASIC--Gate arrays
Daewoo Telecommunications Co., Ltd.	Bipolar linear--audio and video ICs, MOS consumer--ICs for PCs and telecommunications
Korea Electronics Co., Ltd.	Bipolar linear--audio & video circuits, transistors, diodes, LEDs
Group B	
Dung Sung Moolsan Ind. Co., Ltd.	Diodes, rectifiers, varistors
Rohm Korea Corp.	Transistor arrays, diode arrays, LEDs, photo transistors, photo sensors, resistors
KOMY Semiconductor, Ltd.	Diodes, transistors, packaging
Korea Optoelectronics Corp.	Transistors, diodes, solar cells, photo Darlingtons, photo couplers, photo interrupters

Source: Dataquest
September 1988

South Korean semiconductor investment increased dramatically in 1983 when the government launched the Semiconductor Industry Fostering Plan. This plan provided more than $300 million for loans to domestic firms from 1984 to 1987. The major beneficiaries of this financial support are Samsung, Gold Star, and Hyundai. Heated competition among these conglomerates pushed investments higher than original plans, and additional funds were obtained from international financial markets. Since the beginning of 1983, these three Chaebol have invested more than $1 billion in semiconductor technology. More than 90 percent of the total investments have been financed by external debt.

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MAJOR SEMICONDUCTOR OPERATIONS

Gold Star Semiconductor, Ltd.

The Lucky-Gold Star Group is a $13.5 billion company that makes products ranging from toothpaste to apparel, elevators to microwave ovens, electronic switching systems to computers and ICs. The Gold Star Company, a subsidiary of the Group, is the second largest electronics company in South Korea, with 1987 revenue of approximately $2.6 billion. It is a major producer of color televisions, videocassette recorders, microwave ovens, monitors, and terminals. The company is extending its product line to include high-technology items; consequently, it now manufactures minicomputers and mainframes. The Gold Star Company has a factory in Huntsville, Alabama, where it makes a million color televisions per year, in addition to microwave ovens and refrigerators, all for the North American market.

The Group's subsidiary Gold Star Semiconductor (GSS) was established in 1979. GSS is 44 percent owned by AT&T, and produces advanced digital switching systems and semiconductors. GSS has established a design center in its new Sunnyvale, California, offices. To date, GSS has no wafer fab facility in the United States. GSS has been aggressive in establishing foundry and license agreements with major U.S. companies to obtain electronics technology. The technology licenses that GSS holds to date are listed in Company Profiles (Volume III).

Samsung Semiconductor and Telecommunications Co., Ltd.

The Samsung Group is the largest conglomerate in Korea with 26 affiliated companies and sales of $22.5 billion in 1987. Samsung has its strength in electronics products with five electronics-related affiliates. Overall, the electronics sector currently generates one-fifth of the group's total revenue.

Its major electronics affiliate, the Samsung Electronics Company, is the leading South Korean electronics manufacturer, with 1987 sales of approximately $3.0 billion. Samsung Semiconductor and Telecommunications Company (SST), a subsidiary of the Samsung Electronics Group, was created by the government in 1977 to foster South Korea's electronics industry.

SST has a technology license with ITT to make and sell advanced electronic switching systems. SST shares with Gold Star a government-mandated oligopoly to digitize the telephone systems of all South Korean cities. In addition, Samsung has joint ventures with Hewlett-Packard, General Electric, and Corning Glass Works. Samsung also has many subcontractual agreements with American and European companies.

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In semiconductors, SST licensed Micron Technology's 64K and 256K DRAMs, and entered into a joint development pact with EXEL to develop the 2816A 16K EEPROM. Further, SST's recent license from Intel gave SST the right to make and sell microprocessor products in South Korea. All technology agreements are listed in the Company Profiles (Volume III).

In 1974, SST acquired a fab facility in Buchon that enabled the company to manufacture ICs. Its $125 million fab facility in Kiheung, south of Seoul, has a capacity of 35,000 4-inch wafers per month with 3-micron capability. SST added a 6-inch fab, which had a capacity of 20,000 wafers per month, with all steppers for VLSI production in 1985 and increased the capacity to 35,000 wafers per month in 1987.

Samsung Semiconductor, Inc., in Santa Clara, California, is SST's U.S. subsidiary. Established in 1983, the Santa Clara facility houses a 5,000-square-foot pilot line, with 5-inch, 2-micron capability. The company is SST's U.S. arm for sales, marketing, design, and application engineering. Product definition, development, and process debugging are performed in the Santa Clara facility before the designs are transferred back to South Korea for volume production.

Hyundai Electronics Industries Co., Ltd.

Hyundai is South Korea's second largest Chaebol with sales of approximately $19.0 billion. Hyundai's main business lines are automobiles, shipbuilding, and construction. Hyundai was the last of the Big Four to enter electronics, in 1983. The company gained electronics assembly experience through its subcontract with Faraday (PC add-on boards) and Novatel (cellular telephones).

Hyundai Electronics was established in 1983. In addition to semiconductors, Hyundai entered the areas of telecommunications, office automation, and information systems. The company has negotiated second-source agreements with International CMOS Technologies (ICT) for EEPROM technology. Hyundai sampled 16K SRAMs, 8-bit MCUs, and 1K EEPROMs in 1986.

Hyundai established a U.S. subsidiary, Hyundai Electronics America (HEA), in Santa Clara, California. HEA originally devoted most of its 100,000-square-foot complex to semiconductors. The facility contains an 11,000-square-foot wafer fab facility designed to run CMOS on 5-inch wafers with 2-micron design rules. HEA's manufacturing operations were shut down during 1985, and the company sold the fab facility to Siemens in 1986. HEA continues with marketing activities in the United States.

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Daewoo Telecommunications Co., Ltd.

The primary business lines of Daewoo, a $10.5 billion conglomerate, are shipbuilding, international trade, machinery, construction, automobiles, oil, and consumer electronics. Daewoo has PC subcontracts with Leading Edge and Cordata Systems, a computer license with Burroughs, and a joint venture on customized ICs and communication equipment with Northern Telecom. The group's subsidiary, Daewoo Telecom, is one of the four Korean companies picked to modernize South Korea's rural telephone system.

Daewoo Semiconductor is a division of Daewoo Telecommunications. It was established in June 1984. Daewoo's U.S. operations are headquartered in the Silicon Valley in California, at its subsidiary, ID Focus. ID Focus is currently doing market research to develop designs for the electronics and telecommunications divisions of Daewoo. Daewoo does not directly operate a semiconductor facility in the United States, but it has acquired controlling interest of ZyMos in Sunnyvale, California, which it intends to use as its technology source.

Korea Electronics Co., Ltd.

Korea Electronics Co., (KEC) was established in September 1969, under a joint venture with Toshiba Co. of Japan (South Korea, 30 percent; Toshiba, 70 percent). At that time, the company name was Toshiba Korea Co. In 1979, when the company became public, the ownership was changed to 90 percent South Korea, 10 percent Toshiba. The current company name was adopted in March 1974. The company's major products are black-and-white and color television sets, monitors, and semiconductors, mainly bipolar linear and discrete. Total semiconductor sales were $14.7 million in 1982 and an estimated $77.1 million in 1987.

PLANT LOCATIONS

South Korean semiconductor manufacturing is concentrated in two areas: Seoul in the northwest portion of the country, and Gumi in the southeast.

The 1987 wafer production capacity of selected South Korean manufacturers is shown in Table 2. The production capacity of these companies is estimated at 215,000 wafer starts per month, with the majority of this capacity added during the 1980s. South Korean production capacity by wafer size is shown in Table 3. Facilities designed to run 3- and 4-inch wafers account for 41.9 percent of total slices. Five-inch wafer fab lines account for 30.2 percent of capacity, while state-of-the-art 6-inch facilities account for 27.9 percent.

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Table 2

Wafer Production Capacity of Selected Manufacturers—South Korea (1987)

	Plant	Wafer Size	Wafer Starts (average per month)
SST	Buchon	4-inch	25,000
		5-inch	20,000
	Kiheung	4-inch	35,000
		6-inch	35,000
GSS	Gumi	4-inch	18,000
		5-inch	15,000
	Anyang	5-inch	10,000
KEC	Gumi	3-inch	5,000
		5-inch	5,000
Hyundai	Ichon	5-inch	15,000
		6-inch	25,000
Daewoo	Goonpo-eup	4-inch	7,000

Source: Dataquest
September 1988

Table 3

Production Capacity by Wafer Size—South Korea (1987)

Wafer Size	3-inch	4-inch	5-inch	6-inch	Total
Capacity in Average Wafer Starts/Month	5,000	85,000	65,000	60,000	215,000
Percent of Total	2.3%	39.5%	30.2%	27.9%	100%

Source: Dataquest
September 1988

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NATIVE-OWNED SEMICONDUCTOR PRODUCTION

Total semiconductor revenue of the four major manufacturers (Samsung, Gold Star, KEC, and Hyundai) is shown in Table 4. Revenue grew at an estimated cumulative annual rate of 72.0 percent, from $58.7 million in 1982 to $513.2 million in 1987. Total IC growth over the period was dramatic at 109.5 percent, as these manufacturers rapidly came on-line with production facilities able to produce leading-edge circuits. The IC manufacturing base of these companies supported only $21.7 million of IC production in 1983, but leaped to an estimated $418.3 million in 1987.

Table 4

Semiconductor Revenue of Samsung, Gold Star, KEC, and Hyundai
(Millions of U.S. Dollars)

	1983	1984	1985	1986	1987	CAGR 1983-1987
Total Semiconductor	$58.7	$114.0	$174.8	$299.1	$513.2	72.0%
IC	21.7	51.0	117.8	229.1	418.3	109.5%
Bipolar Digital	0	1.5	7.3	14.4	21.1	142.0%
MOS	10.0	26.5	65.0	158.3	302.0	134.4%
Linear	11.7	23.0	45.5	56.4	95.2	68.9%
Discrete	34.5	60.0	55.0	67.7	91.9	27.8%
Optoelectronic	2.5	3.0	2.0	2.3	3.0	4.7%

Source: Dataquest
September 1988

Semiconductor revenue for the top four manufacturers (by company and product category) is presented in Table 5. Samsung, Gold Star, and Hyundai each demonstrated growth rates in excess of 80 percent from 1983 to 1987. These three manufacturers are heavily committed to developing their semiconductor manufacturing capability and have invested large amounts of capital to this end. KEC's revenue growth, 31 percent, is less than half that of Samsung and Gold Star. KEC has participated at a lower level in the rush to develop capacity; however, as an established device manufacturer, the company had 1983 revenue of $26.4 million, highest of the top three manufacturers. Meanwhile, Samsung and Gold Star both started the period with combined revenue of less than $26 million. KEC's primary product areas are linear and discrete devices.

Table 5

Semiconductor Revenue of Samsung, Gold Star, KEC, and Hyundai
by Company
(Millions of U.S. Dollars)

	1983	1984	1985	1986	1987	CAGR 1983-1987
Samsung						
Total Semiconductor	$25.9	$60.0	$95.0	$170.0	$327.3	88.5%
IC	14.0	33.0	75.0	144.3	281.2	113.6%
Bipolar Digital	0	0	0	0	0	0
MOS	9.9	25.0	55.0	117.4	242.2	122.4%
Linear	4.1	8.0	20.0	26.9	48.0	85.9%
Discrete	11.9	27.0	20.0	25.7	36.1	32.0%
Optoelectronic	0.0	0.0	0.0	0	0	0
Gold Star						
Total Semiconductor	$ 6.4	$16.0	$32.8	$ 48.2	$ 67.9	80.5%
IC	3.9	13.0	29.8	47.5	67.1	103.7%
Bipolar Digital	0	1.5	7.3	13.3	21.1	141.5%
MOS	0.1	1.5	5.0	4.6	19.8	275.1%
Linear	3.8	10.0	17.5	29.6	26.2	62.0%
Discrete	2.5	3.0	3.0	0.7	0.7	(24.8%)
Optoelectronic	0	0	0	0	0	0
Korea Electronics						
Total Semiconductor	$26.4	$38.0	$42.0	$ 50.3	$ 78.0	31.1%
IC	3.8	5.0	8.0	10.0	20.0	51.5%
Bipolar Digital	0	0	0	0	0	0
MOS	0	0	0	0	0	0
Linear	3.8	5.0	8.0	10.0	20.0	51.5%
Discrete	20.1	30.0	32.0	38.0	55.0	28.6%
Optoelectronic	2.5	3.0	2.0	2.3	3.0	4.7%
Hyundai Electronics						
Total Semiconductor	-	-	$ 5.0	$ 21.0	40.0	182.8%
IC	-	-	5.0	21.0	40.0	182.8%
Bipolar Digital	-	-	0	0	0	0
MOS	-	-	5.0	21.0	40.0	182.8%
Linear	-	-	0	0	0	0
Discrete	-	-	0	0	0	0
Optoelectronic	-	-	0	0	0	0

Source: Dataquest
September 1988

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JOINT VENTURES AND LICENSE AGREEMENTS

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CAPITAL SPENDING

In their efforts to become full-fledged participants in the worldwide semiconductor industry, South Korean manufacturers are investing heavily in R&D and semiconductor manufacturing capability. Semiconductor-related capital spending for the top four companies is presented in Table 6.

Total South Korean capital spending in 1984 was $463 million. In 1985, the $490 million capital spending figure was slightly higher than the 1984 figure. Since most of the factories and R&D programs initiated by the major industry and government push in 1983 came on-stream in 1984 and 1985, investment is expected to taper off in coming years. Total 1986 spending was estimated to be $328 million, while 1987 spending was estimated to be $381 million.

The establishment of production facilities accounted for the major 1984 share of capital spending at $421 million, or 91 percent of total dollar investment. R&D expenditures as a share of total spending were anticipated to increase from 7 percent in 1984 to 20 percent in 1987.

A description of the R&D facilities established by the Big Four manufacturers is given in Table 7.

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Table 6

Estimated Semiconductor-Related Capital Spending—South Korea
(Millions of U.S. Dollars)

	1984	1985	1986	1987
Facilities	$421	$429	$275	$304
Samsung	160	180	120	120
Hyundai	131	129	37	35
Gold Star	96	100	80	89
KEC	34	20	17	5
Daewoo	-	-	21	55
R&D	$ 42	$ 61	$ 53	$ 77
Samsung	16	40	30	10
Hyundai	7	12	6	36
Gold Star	16	7	10	20
KEC	3	2	3	1
Daewoo	-	-	4	10
Total Investment	$463	$490	$328	$381

Table 7

Research and Development Facilities—South Korea
(1987)

Company	Location	Year Established	Man Power Employees	Floor Space (m^2)	R&D Exp. (% of Sales)
SST	Buchon	1981	150	1,000	19.1%
SST	Kiheung	1985	430	8,500	52.9%
GSS	Anyang	1984	400	3,300	52.2%
KEC	Gumi	1984	120	1,300	1.3%
Hyundai	Ichon	1984	58	1,300	32.5%
Daewoo	Seoul	1986	40	1,000	N/A

N/A = Not Available

Source: Dataquest
September 1988

Corporate R&D--Hong Kong

INTRODUCTION

Native-owned Hong Kong semiconductor manufacturers and their products are listed in Table 1. The Group A companies shown in the table have wafer fabrication facilities in addition to assembly and testing setups. The Group B companies are engaged primarily in the assembly, packaging, and testing of semiconductors. This chapter focuses on the Group A companies, as their activities and development are most significant to the future competitiveness and diversity of the Hong Kong semiconductor industry in the world market. Unless otherwise specified, in-text currency references are to U.S. dollars.

Table 1

NATIVE-OWNED SEMICONDUCTOR MANUFACTURERS--HONG KONG

Company	Products
Group A	
Elcap Electronics, Ltd.	MOS logic--high-speed CMOS logic (74HC/HCT series) MOS memory--static RAM (NMOS), ROM (NMOS), up to 16K x 8 Bipolar linear--telecom and consumer ICs
Hua Ko Electronics Co., Ltd.	Gate array--fully custom and semicustom (Si-Gate CMOS) CMOS MPU--65CXX series and Z80A MOS logic--74/54, HC/HCT high-speed CMOS logic MOS memory--16K SRAM, 64K DRAM, 16K EPROM Bipolar linear--audio and video ICs
RCL Semiconductors, Ltd.	MOS memory--64K DRAM, 256K DRAM, ROM up to 16K x 8 MOS logic--74HC/LS series, watch and calculator chips Bipolar linear--audio, video, telecom, industrial (A/D converter) and consumer ICs MOS CPU--65CXX series LCD--fully custom

(Continued)

Table 1 (Continued)

NATIVE-OWNED SEMICONDUCTOR MANUFACTURERS--HONG KONG

Company	Products
Group B	
Electronics Devices, Ltd.	Glass diodes Transistors in T092 and ROT23 LED lamp and LED displays
Fairchild Semiconductor Hong Kong, Ltd.	Closed Hong Kong assembly and manufacturing operation in 1986
Microelectronics	Custom IC assembly--8- to 14-pin rectifiers Transistors--T092, T039, T0237, and T0180 Opto-LED lamp and panel display
Motorola Semiconductors Hong Kong, Ltd.	Testing of microprocessors, linear ICs and transistors
National Semiconductor Hong Kong, Ltd.	Testing of transistors Computer board assembly
Semiconductor Devices, Ltd.	ICs--CERDIP (Metalized/glass) and flatpack
Siliconix (Hong Kong), Ltd.	Field effect transistors (FET) Junction field effect transistors (JFET) MOSFET
	ICs--side-braze DIP, CERDIP and flatpack for telecom, analog switch and A/D converters
Teledyne Hong Kong, Ltd.	ICs for industrial use and instrumentation (A/D converters)

Source: Dataquest
March 1987

Corporate R&D--Hong Kong

Microelectronics was the first Hong Kong company to start wafer fabrication, and (on a very limited scale) transistor and diode wafer fabrication. The year was 1964, and the technology used was 8- to 9-micron. The product was 2-inch wafers. However, 1979 was the real beginning of Hong Kong's semiconductor wafer fabrication for LSI when RCL started to produce 3- to 4-inch CMOS wafers for electronic watches and calculators. Wafer fabrication was started by Elcap and Hua Ko in 1982 and 1983, respectively. The Industry Development Board of Hong Kong was established in 1983. Since then, more than HK$2 million has been allocated to joint research and development projects by local universities, polytechnics, and Hong Kong semiconductor factories to foster local VLSI development.

MAJOR SEMICONDUCTOR OPERATIONS

Elcap Electronics, Ltd.

Elcap is one of three pioneer semiconductor companies that invested more than $200 million in its sophisticated wafer fabrication facility. It began wafer fabrication in early 1982, and 1985 sales were approximately $10 million. In November 1985, the company completed the construction of a class-10 clean room. The room was equipped and went into operation in December 1985.

Elcap is moving from 3.5-micron technology to 1.5-micron technology. The company can produce gate arrays with 4,000 gates. It is the only IC manufacturer in Hong Kong using steppers that can print lines finer than 2 microns. Elcap's plan is to develop standard cells in 1987 and to follow up with full-custom gate arrays and memory logic by 1988.

Elcap's 1985 sales were approximately $12 million. It has invested more than $130 million in the past three years to modernize its fabrication facility and design automation center. Elcap also invested a few million dollars in a U.S. software house in 1981. The turnover of this publicly listed software house has increased from $2 million to more than $200 million, and Elcap has gained substantially from this investment.

Elcap obtains its wafer fabrication expertise and design and engineering support from both overseas consultants and from Hong Kong engineers with overseas experience and education. Elcap's major markets are the United States, Europe, and China.

Corporate R&D--Hong Kong

Hua Ko Electronics Co., Ltd.

Hua Ko began wafer fabrication in early 1983, specializing in CMOS technology. The first series of products was based on the CMOS version of the 65 series microprocessor. At a later stage, the Z80 microprocessor was developed by employing NMOS. Hua Ko's annual sales range from $4 to $6 million. Between 1983 and 1986, Hua Ko invested more than $100 million in capital equipment and design facilities for wafer fabrication and IC assembly.

Since 1984, Hua Ko has broadened its product line to include static memory, EPROM, 74HC/HCT CMOS logic, gate arrays up to 2,000 gates, telecommunication chips, and consumer linear. It is currently using 3-micron technology to produce 4-inch wafers.

Hua Ko markets its products mainly in Hong Kong, China, and Europe. Hua Ko has also designed and assembled board-level and personal computers to market in Europe and China. Future product emphasis for Hua Ko is on the 74HC/HCT series of CMOS logic, semicustom and customized ICs.

RCL Semiconductors, Ltd.

In 1979, RCL became the first Hong Kong semiconductor manufacturer to successfully produce LSI wafers for electronic watches by using 6-micron technology. RCL progressed to the 4-micron level in 1984 when the company started development of Intel microprocessors. With the addition of new equipment to its fabrication line in 1985 and 1986, RCL can now handle 2.5-micron technology to produce memory, peripheral, and bipolar linear ICs.

Between 1979 to 1983, RCL used U.S. consultants extensively to help start its fabrication line. Most of the in-house engineers and technical team were sent to the United States for three to six months of training. In 1982, RCL began to produce LCD. In 1984, RCL diversified into industrial ICs such as A/D converters and interface chips.

RCL's major markets are Asian countries. Semicustom ICs are RCL's main business line; it can offer gate arrays under 1,000 gates in either silicon or metal. Hong Kong is its main market, followed by Taiwan and China. RCL annual sales are approximately $6 to $8 million. It has invested over $150 million in its fabrication and assembly line.

Corporate R&D--Hong Kong

PLANT LOCATIONS

Elcap, Hua Ko, and RCL are all located in the Tai Po Industrial Estate. Tai Po is an industrial site managed by the government, backed by the Hong Kong Industrial Estates Corporation. The industrial estates consist of 46-hectare parcels of land allocated to high technology and other industries considered essential to the long-term viability of Hong Kong's economy. During the first six years of operation the government has offered land at a fixed price. This price varies according to construction costs and market conditions.

NATIVE-OWNED SEMICONDUCTOR PRODUCTION

Semiconductor production estimates for Hong Kong manufacturers with wafer fabrication facilities are shown in Table 2, which includes output of Elcap, Hua Ko, and RCL. Revenue of these three companies is estimated to grow at a cumulative annual rate of 31.0 percent, from $11.8 million in 1983 to $26.5 million in 1986 (see Table 3).

Semiconductor revenue for the three wafer fabrication-based companies, by company and product category, are summarized in Table 4.

Table 2

WAFER PRODUCTION CAPACITY OF ELCAP, HUA KO, AND RCL

		Wafer Starts (average per month)			
	Wafer Size	1983	1984	1985	1986
Elcap	4-inch	5,000	8,000	100,000	130,000
Hua Ko	4-inch	2,000	3,000	4,500	6,000
RCL	4-inch	4,000	8,000	4,000	5,000

Source: Dataquest
March 1987

Table 3

SEMICONDUCTOR REVENUE OF ELCAP, HUA KO, AND RCL
(Millions of U.S. Dollars)

	1983	1984	1985	1986	CAGR 1983-1986
Total Semiconductor	$11.8	$31.2	$24.5	$26.5	31.0%
Bipolar Digital	2.0	6.0	8.0	8.5	61.0%
MOS	8.0	20.0	14.0	15.0	23.5%
Linear	1.0	4.0	2.5	3.0	45.0%
Discrete	-	-	-	-	-
Optoelectronic	0.8	1.2	-	-	-

Source: Dataquest
March 1987

Table 4

SEMICONDUCTOR REVENUE OF ELCAP, HUA KO, AND RCL BY COMPANY
(Millions of U.S. Dollars)

	1983	1984	1985	1986
ELCAP				
Total Semiconductor	$4.0	$14.0	$12.5	$13.9
Bipolar Digital	0.7	2.5	3.5	4.5
MOS	3.0	10.0	8.0	8.0
Linear	0.3	1.5	1.0	1.4
Optoelectronic	0.0	0.0	0.0	0.0
HUA KO				
Total Semiconductor	$2.8	$ 6.2	$ 4.5	$ 6.4
Bipolar Digital	0.7	1.5	2.0	2.8
MOS	2.0	4.0	2.0	3.0
Linear	0.1	0.7	0.5	0.6
Optoelectronic	0.0	0.0	0.0	0.0
RCL				
Total Semiconductor	$5.0	$11.0	$ 7.5	$ 6.2
Bipolar Digital	0.6	2.0	2.5	1.2
MOS	3.0	6.0	4.0	4.0
Linear	0.6	1.8	1.0	1.0
Optoelectronic	0.8	1.2	0.0	0.0

Source: Dataquest
March 1987

JOINT VENTURES AND LICENSE AGREEMENTS

None of the Hong Kong semiconductor companies have formal license, joint venture, technology transfer, or technology cooperation agreements with overseas counterparts. However, the three major fabrication houses have hired western consultants and bought shares in overseas semiconductor firms to obtain technology and expertise. In 1974, Microelectronics invested in a small fabrication house (Mononsil Incorporated) to supply it with custom ICs. However, Microelectronics did not transfer the technology to start wafer fabrication in Hong Kong.

CAPITAL SPENDING

To attain the most current fabrication technology, the three major semiconductor firms have invested heavily in R&D and new equipment. This should enable them to compete with the worldwide leaders in the semiconductor industry. Semiconductor-related capital spending for the major companies is given in Table 5.

Table 5

ESTIMATED SEMICONDUCTOR-RELATED CAPITAL SPENDING--HONG KONG
(Millions of U.S. Dollars)

	1984	1985	1986	1987
Facilities	$163	$173	$120	$135
Elcap	55	53	66	78
Hua Ko	46	44	26	32
RCL	62	76	28	25
R&D	$ 17	$ 17	$ 10	$ 15
Elcap	5	7	4	8
Hua Ko	4	6	4	5
RCL	8	4	2	2
Total Investment	$180	$190	$130	$150

Source: Dataquest
March 1987

Corporate R&D--Hong Kong

Total 1984 capital spending amounted to $180 million. Of this amount, $163 million (90.6 percent) was spent to establish production facilities. Total 1985 capital spending increased by 5.6 percent to $190 million. In 1987, it is estimated that $150 million (90 percent of total capital spending) will go toward establishment of production facilities.

X

Strategic Alliances--South Korea

JOINT VENTURES AND LICENSE AGREEMENTS

Semiconductors are the common denominator in South Korea's efforts to develop high-technology manufacturing. Compared to their American and Japanese counterparts, South Korean companies are playing catch-up from a very late start; however, they are very aggressive and ambitious. The combination of government and industry focus and support is yielding the same dramatic results as Japan's entry into semiconductor production during the 1970s. Furthermore, the South Koreans are trying to accomplish in 5 years what it took the Japanese 20 years to develop: a self-sufficient semiconductor industry. This much-reduced timetable would not be feasible without the formation of alliances. Unlike Japan, South Korea welcomes alliances and foreign ownership.

A foreign technology agreement enables South Korean manufacturers to move ahead more rapidly in developing an indigenous semiconductor industry than purely internal development would allow. The rapidity with which alliances are being formed is startling. In the span of only two years, from 1983 to 1985, four native South Korean semiconductor manufacturers have entered into more than 20 technology and production alliances. A summary of agreements for semiconductor technology is presented in Table 1. The majority of the technology agreements have been made with U.S. manufacturers; very few have been made with Japanese companies.

Table 1

Semiconductor Technology Alliances by Company

Samsung Semiconductor and Telecommunications Co., Ltd.

Year	Partner	Agreement	Products
1982	Sharp (Japan)	TTA	4-bit microprocessor
1982	DITTI (Germany)	TTA	Linear IC, CMOS, SS-transistor
1983	Micron Technology (United States)	TTA	64K DRAM, 256K DRAM
1983	Sharp (Japan)	TTA	MOS process
1984	DITTI (Germany)	TTA	CIT process
1984	Samsung Semiconductor (United States)	TTA	16K EEPROM, 64K DRAM, 16K SRAM
1985	Samsung Semiconductor (United States)	TTA	64K SRAM, 256K DRAM, EPROM, EEPROM
1985	Intel (U.S.)	T/C	MPU, MCU
1985	National Semiconductor	TTA	Gate array
1985	Zytrex (United States)	TTA	Standard logic
1986	Ixys (United States)	TTA	Power MOSFET
1986	Intel (United States)	TTA	EPROM
1988	Ixys (United States)	TTA	Smart power IC

Gold Star Semiconductor, Ltd.

Year	Partner	Agreement	Products
1981	AT&T (United States)	J/V, TTA	Bipolar process technology
1982	AT&T (United States)	TTA	MOS technology
1983	Zilog (United States)	TTA	8-bit microprocessor
1984	LSI Logic (United States)	TTA	Gate array
1984	AMD (United States)	R/A	All AMD products in Korea
1984	AMD (U.S.)	TTA	64K DRAM design
1985	LSI Logic (United States)	TTA	Gate array
1985	Fairchild (United States)	TTA	64K SRAM
1985	UMI (United States)	TTA	HCT, TTL
1985	BRI (United States)	TTA	Standard cell
1986	Fairchild (United States)	TTA	Combo IC
1986	UMI (United States)	TTA	256K DRAM, 1M DRAM

(Continued)

Table 1 (Continued)

Semiconductor Technology Alliances by Company

Korea Electronics Co., Ltd.

Year	Partner	Agreement	Products
1978	Toshiba (Japan)	TTA	Pellet
1983	Toshiba (Japan)	TTA	Linear IC
1984	Toshiba (Japan)	TTA	MOS technology

Hyundai Electronics Industries Co., Ltd.

Year	Partner	Agreement	Products
1983	Hyundai Electronics America (United States)	TTA	NMOS and CMOS process technology, 16K SRAM, 128K ROM
1984	TI	TTA	64K DRAM
1984	International CMOS Technologies (United States)	T/C	64K EPROM, 1K EEPROM, PEEL
1984	Inmos	UK	256K DRAM
1985	Western Design Center (United States)	TTA	8-bit, 16-bit CMOS microprocessor
1985	Mosel (United States)	TTA	64K SRAM
1985	Vitelic (United States)	TTA	256K DRAM
1986	Vitelic (United States)	TTA	256K SRAM, 256K VRAM 1M DRAM
1988	LSI Logic	TTL	256K SRAM, 256K VRAM, 1Mb DRAM, LL-7000 gate array

Daewoo Telecommunications Co., Ltd.

Year	Partner	Agreement	Products
1986	Zymos (United States)	TTA	MOS process, standard cell

TTA = Technology Transfer Agreement (second sourcing)
J/V = Joint Venture Agreement
R/A = Representative Agreement
T/C = Technology Cooperation Agreement

Source: Dataquest
April 1989

Strategic Alliances—Taiwan

Table 1 summarizes the semiconductor technology agreements made by semiconductor companies and organizations in Taiwan with foreign partners or other domestic companies from 1980 to February 1990.

Table 1

Semiconductor Technology Alliances by Company—Taiwan
(Year, Partner, Agreement, and Products)

United Microelectronics Corporation

Year	Partner	Agreement	Products
1980	ERSO	TTA	N/A
1982	ERSO	TTA	5.0u, 3.5u CMOS
1983	AMI	T/C	Telephone dialer ICs
1983	IDT	TTA	2.5u CMOS
1984	MOSel	T/C	16K SRAMs
1985	MOSel	TTA	1.25u retrograde CMOS
1985	TRW	TTA	Telephone dialer ICs
1986	SMC	TTA	CRT controllers
1986	Sunol	TTA	Hard disk controllers
1986	SDC	TTA	ASICs
1989	ERSO	TTA	Submicron IC R&D plant

ITRI/ERSO

Year	Partner	Agreement	Products
1984	Vitelic	T/C	64K CMOS DRAMs 256K CMOS DRAMs 64K CMOS EPROMs
1989	Philips	T/C	HDTV ICs
1989	AMPI, HMC, UMC, Winbond, Vitelic	T/C	Submicron IC R&D
1989	Philips	T/C	Optical disk drive

Taiwan Semiconductor Manufacturing Co., Ltd. (TSMC)

Year	Partner	Agreement	Products
1986	Philips	TTA	Main process
1986	ERSO	TTA	Mainstream products
1986	ERSO	T/C	Fab lease
1987	ERSO	TTA	N/A
1987	Philips	TTA	N/A
1989	Vitelic	TTA	Memory ICs; 1Mb DRAMs
1989	Philips	J/V	Consumer ICs
1989	ERSO	T/C	Submicron IC R&D

(Continued)

Table 1 (Continued)

Semiconductor Technology Alliances by Company—Taiwan
(Year, Partner, Agreement, and Products)

Hualon Microelectronics Corporation (HMC)

Year	Partner	Agreement	Products
1988	ERSO	TTA	Consumer ICs
1989	ERSO	T/C	Submicron IC R&D

Winbond

Year	Partner	Agreement	Products
1988	ERSO	TTA	Consumer ICS
1989	NCR	TTA	ASICs
1989	ERSO	T/C	Submicron IC R&D

AMPI

Year	Partner	Agreement	Products
1988	ERSO	TTA	Power ICs
1989	ERSO	T/C	Submicron IC R&D

ACC Microelectronics Corporation

Year	Partner	Agreement	Products
1989	Motorola	TTA	Floppy disk drive control chips

Acer Group

Year	Partner	Agreement	Products
1989	Texas Instruments	J/V	1Mb, 4Mb DRAMs
1990	National	TTA	Super I/O chips

N/A = Not Available
TTA = Technology Transfer Agreement (second sourcing)
J/V = Joint Venture
R/A = Representative Agreement
T/C = Technology Cooperation Agreement

Source: Dataquest
March 1990

Strategic Alliances--China

Table 1 is a summary of semiconductor technology agreements made by major Chinese Semiconductor companies.

Table 1

Semiconductor Technology Agreements to China

Company	Type of Activity	Value	Product	Location	Comments
Applied Materials	Joint venture	-	Semi. prod. systems, epitaxial reactors	Beijing	Service center
Belgium-Bell	Joint venture	$12.0M	Telecom chip	Shanghai	4" fab 1989
Cermetek	Turnkey mfg.	US$1.7M	Thick-film hybrid ICs, modem components	Anhui	Option to buy back products, telecom ind. support
Fuji Electric	Turnkey mfg.	US$4.6M	Silicon diodes	Tianjin	-
GE	Turnkey mfg.	-	Power transistors	-	-
Crow Electric	Turnkey mfg.	-	Bipolar transistors (color TV)	Dandong	-
Mostek	Turnkey mfg.	-	16K production line	-	Used line
Motorola	Wholly owned	$100.0M	ICs	Tianjin	5" fab will be finished by 1992
National Semiconductor	Turnkey mfg.	-	MSI line (3 inch)	Shanghai	Option for National to use for assembly, used line
NEC	Joint venture	$60.0M	ICs	Beijing	5" fab will be finished by 1991
Nippon Ceramic	Joint venture	-	Sensor	Shanghai	-
Philips	Joint venture	$40.0M	Consumer ICs	Shanghai	5" fab will be finished by 1991
Siemens	Technology transfer agreement	-	ICs	Wuxi	5" fab will be finished by 1991
Solid State Sci.	Turnkey mfg.	-	CMOS line (3 inch), watch ICs (5 micron)	Shanghai	Used line (5-6 yrs.)
Toshiba	Technology transfer agreement	-	TV chip set, consumer ICs	Wuxi	

Source: Dataquest
February 1990

Equipment and Materials—South Korea

South Korea has no major native semiconductor equipment manufacturers. U.S. manufacturers have supplied 60 percent of the wafer fab equipment required to outfit the more than two million square-foot enlargement of semiconductor facilities that has occurred in the last three years; Japanese manufacturers have supplied the remaining 40 percent.

In 1985, a few South Korean companies began to produce noncritical processing equipment. But, to date, these new entrants have attained no significant share of the domestic market. The equipment industry is an important part of South Korea's semiconductor industry infrastructure. Domestic manufacturing will, therefore, be a candidate for government support.

As with wafer fab equipment, semiconductor production materials are supplied primarily by the United States and Japan. South Korean firms do, however, manufacture lead frames, low-grade chemicals, and some miscellaneous supplies used in production lines. They are working to develop the technology to enter other materials markets and are entering into foreign partnerships in pursuit of this goal. Recently, three South Korean companies announced plans to produce polished wafers.

Materials suppliers located in South Korea, their products, and (where applicable) their partners are shown in Table 1.

Table 1

Materials Suppliers—South Korea

Company	Location	Material	Business Partner
Daesung Oxigen	Banwo/gongdan Kunggido, South Korea	Gases	Air Liquid in French
Dongjin Whasung	N/A	Photoresist	N/A
Hamryu Development	(Tel: 737-8172)	Photomasks	Dupont
Gold Star Electric	379, Kasuri, Usan-up, Whasung-kum, Kyungki-do	Lead frames	N/A
Korea Industrial Gases	64-5, Choongmu 2-ga, Chung-gu, Seoul	Bulk industrial gases	Air Product & Chemicals (United States)
Kosil	Gumi City, Kyongbuk	Polished wafers	Monsánto (United States)
Lami	60-1, Choongmuro 3-ga, Chung-gu, Seoul	Polished wafers	Epitaxi (United States)
Poong San	52, Banyeo 1 Dong, Haewoondae-gu, Pusan	Lead frames material	KAIST (Korea)
Samsung	42, Sungju-dong, Changwon City, Kyungnam	Lead frames	N/A
Union Carbide	C.P.O. Box 4302, Seoul	Bulk and specialty gases, photoresist	N/A

N/A = Not Applicable

Source: Dataquest
September 1988

Equipment and Materials—Taiwan

Taiwan has no major semiconductor equipment manufacturers. More than half of the wafer fabrication and testing equipment is supplied by U.S. manufacturers. Local semiconductor materials suppliers manufacture primarily lead wire and small-size (2- to 4-inch) silicon wafers. Taiwan's major semiconductor materials suppliers are the United States and Japan.

DOMESTIC PACKING-MATERIALS SUPPLIERS

Jay Pao Precision Industry Company, Ltd.

Business liaison: Nelly Shiao

Address: 2/F, 618, Lane 10, Sheng-Lih St., Tu-Cheng Hsiang, Taipei Hsien, Taiwan

Telephone: (02) 260-7988/9

Telex: 33311 JAY PAO

Fax: (02) 260-0879

Established: 1982

Employees: 35

Capital: US$250,000

Materials: Lead wire used in electronic parts (e.g., rectifiers, diodes, bridges)

Lead Precision Industry Company, Ltd.

President: K. S. Chen

Address: 2/F, 27, Chiang Street, Tu Cheng Industrial Distribution, Tu Cheng Hsiang, Taipei Hsien, Taiwan

Telephone: (02) 260-7488, 260-7791

Established: 1977

Employees: 40

Capital: US$56,000

Materials: Lead wire, lead attachment machines with automatic feed mechanisms, conductive wire for semiconductor rectifiers

Taiwan Metal Mining Corporation

Chairman: K. C. Chin

Address: 8, Chin Kuang Road, Kuey Fang Chen, Taipei Hsien, Taiwan

Telephone: (02) 771-8161
(032) 881-481

Cable: TAICOPPER TAIPEI

Established: 1955

Capital: US$35,000,000

Materials: Gold, silver, and brass strips; gold and aluminum banding wire

DOMESTIC SILICON SUPPLIERS

Tatung Company

President: W. S. Lin

Address: 22, Sec. 3, Chung Shan N. Road, Taipei, Taiwan

Telephone: 592-5252

Telex: (02) 591-5185

Fax: (02) 591-5185

Established: 1918

Employees: 22,580

Capital: US$135,000,000

Market share: Approximately 5 to 10 percent of domestic market for IC silicon slices

Equipment and Materials—Taiwan

Sino-American Silicon Products, Inc.

Chairman: Yen Tao

Address: 8 Industry E. Road II, Science-based Industrial Park, Hsinchu, Taiwan

Telephone: (035) 772-233

Telex: 11297 11538 TRADEVEL

Established: 1981 (closed for a year, started production in 1984)

Products: Silicon single crystal ingots, silicon single crystal wafers, polycrystalline silicon and related material for manufacturing silicon crystal, technical information and services for crystal precision technology

Wafer size: 2-inch, 2.5-inch, 3-inch, 4-inch

Production capacity: 100,000 2-inch wafers per month
100,000 2.5-inch wafers per month
100,000 3-inch wafers per month

EQUIPMENT SALES AGENTS

Hermes Epitek Corporation

President: Ming-chi Huang

Address: 3/F-1, 376, Sec. 4, Jen Ai Road, Taipei, Taiwan

Telephone: (02) 709-7606

Established: 1977

Employees: 20

Main imports: Semiconductor electronic equipment, computers (electronic equipment, technical computer systems)

Main clients: UMC, ERSO, Chung-Shan Technology Institute, and several research institutes

Equipment and Materials—Taiwan

San Lien Development Company, Ltd.

President: Jung-chu Lin

Address: 3/F, 197, Sec. 3, Chung Hsiao E. Road, Taipei, Taiwan

Telephone: (02) 781-3114

Established: 1967

Employees: 56

Main imports: IC wire bonders, die bonders, recorders, dicing saws

Scientech Corporation

President: Horng-Liaug Hsieh

Address: 6/F-2, 633, Tun Hwa S. Road, Taipei, Taiwan

Telephone: (02) 704-7926

Established: 1979

Employees: 12

Capital: US$50,000

Main imports: Chemistry instruments, electronic parts, optoelectronic equipment

Main clients: UMC, ERSO

Scientek Corporation

President: Tzung-che Tsai

Address: 10/F-1, 180, Sec. 4, Nanking E. Road, Taipei, Taiwan

Telephone: (02) 731-2911

Established: 1979

Employees: 24

Capital: US$500,000

Main imports: Scientific instruments, electronic equipment, chemical analysis equipment

Main clients: UMC, ERSO

Equipment & Materials—Hong Kong

Hong Kong has no major semiconductor equipment manufacturers. Over 70 percent of its wafer fabrication and testing equipment is supplied by U.S. manufacturers. The remaining 30 percent is supplied by Japanese and European vendors.

Hong Kong semiconductor materials suppliers manufacture primarily lead frames and headers. Hong Kong's major semiconductor materials suppliers are the United States and Japan.

Table 1 shows the semiconductor equipment and materials suppliers in Hong Kong.

Table 1

Semiconductor Equipment and Materials Suppliers—Hong Kong

Company	Location	Product
3M Far East, Ltd.	5th Floor, Victoria Centre Watson Road, North Point Hong Kong Tel: 5-8079211 Tlx: 73028 TRIMI HX	Materials
Advance Test Control Co., Ltd.	Unit 603, Citicorp Centre 18 Whitfield Road Causeway Bay, Hong Kong Tel: 5-8072236 Fax: 5-8071503 Tlx: 80587 ATESTHX	Test equipment
Alpha Metals, Ltd.	213 Wai Yip Street 1/F Pioneer Industrial Building Kwun Tong, Kowloon Tel: 3-438256 Tlx: 44467 ACMET HX	Chemicals and solder
Asahi Chemical Industry (HK), Ltd.	Room 1520 Prince's Bldg. Des Voeux Road C Central District, Hong Kong Tel: 5-211423	Materials
ASM Assembly Automation	12/F Watson Centre 16-22 Kung Yip Street Kwai Chung, Hong Kong Tel: 0-279371 Tlx: 45924 ASMAT HX	Bonders
ASM Plating, Ltd.	Woo Kee Hong Building Tel: 0-232077	Lead frames and plating
Computer Vision Designer Systems (HK), Ltd.	15/F, Wheelock House 20 Pedder Street Central, Hong Kong Tel: 5-8427111	CAD/CAM systems

(Continued)

Table 1 (Continued)

Semiconductor Equipment and Materials Suppliers—Hong Kong

Company	Location	Product
Degussa China, Ltd.	2309 Wing on Centre Connaught Road Central Hong Kong Tel: 5-445123 Tlx: 75251 DGUSA	Semiconductor material equipment and testers
Design Technology, Ltd.	Room 1501 Arion Commercial Centre 2-12 Queen's Road West Hong Kong Tel: 5-415070, 5-415169 Fax: 5-413206 Tlx: 60319 KLDTL HX	CAD/CAM Consultants & Services
Digital Equipment H.K., Ltd.	20/F Fleet House 38 Gloucester Road Wanchai, Hong Kong	CAD/computers
DuPont (HK), Ltd.	1122 New World Office Bldg. 24 Salisbury Road Kowloon Tel: 3-7345345	Freon cleaning solvent
Hong Kong Oxygen & Acetylene Co., Ltd.	DD234 Lot 317 Hang Hau Clearwater Bay Tel: 3-7198411	Bulk and specialty gases
K & S	2/F Fook Cheong Building 63 Hoi Yuen Road Kwun Tong Tel: 3-440140 Tlx: HX 44497 KUSAG	Bonders
KRAS Asia, Ltd.	KRAS Asia Industrial Bldg. 1st to 3rd Floor 79 Hung To Road Kwun Tong, Kowloon Tel: 3-444141 Tlx: 45089 KRAKAS HX	Semiconductor equipment

(Continued)

Table 1 (Continued)

Semiconductor Equipment and Materials Suppliers—Hong Kong

Company	Location	Product
LTX	603 Citicorp Centre 18 Whitfield Road Causeway Bay, Hong Kong	Automatic test equipment
Meco Metal Finishing Engineering (HK), Ltd.	Golden Bear Industrial Centre Tel: 0-444207	Lead frames and plating
Mitsui High Tec (HK), Ltd.	35 Hung To Road	Lead frames
Monsanto Fe, Ltd.	Great Eagle Centre Tel: 5-740738	Polished wafers
Oro Electronics (HK), Ltd.	15 Ko Fai Road Tel: 3-489261	Headers and plating
Perkin-Elmer East Asia, Ltd.	Room 1303 Fourseas Building 208 Nathan Road Kowloon	CAD/computers
Schlumberger Systems	1104-1106, Wayfoong Plaza 6643 Nathan Road, Kowloon Tel: 3-916381 Tlx: 40527 SSAC HX	Testing systems
Schmidt & Co. (HK), Ltd.	18/F Great Eagle Centre 23 Harbour Road Wanchai, Hong Kong Tel: 5-8330222 Tlx: 74766 SCHMC HX	Mask aligners
Sun Microsystems, Inc.	29/F Shui On Centre 8 Harbour Road Wanchai, Hong Kong	CAD/Workstations

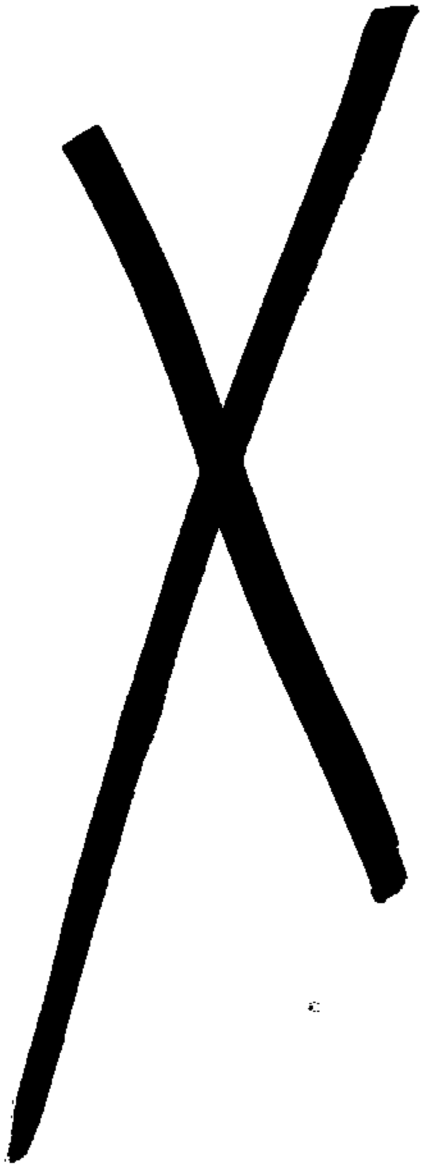
(Continued)

Table 1 (Continued)

Semiconductor Equipment and Materials Suppliers—Hong Kong

Company	Location	Product
Tempress Microelectronics (HK), Ltd.	Room 1903, Park-In Commercial Centre 56 Dundas Street Mongkok, Kowloon Tel: 3-854048 Tlx: 43103 LHDHK HX	Bonders
Varian Pacific, Inc.	Room 1018-20 Tower A Mandarin Plaza Tsimshatsui East, Kowloon Tel: 3-7242836	Semiconductor equipment
Wacher-Chemitronic GMBH	Germany	Polished wafers

Source: Dataquest
June 1988



Fab/Foundry Data Base—South Korea

FABRICATION FACILITIES

Table 1 represents a compilation of all available data on semiconductor production and assembly facilities of selected native South Korean manufacturers. The following companies and plants are described in the facilities chart:

- Samsung Semiconductor and Telecommunications
  - Buchon Plant
  - Kiheung Plant
  - Samsung Semiconductor (U.S.)
- Gold Star Semiconductor
  - Gumi Plant I
  - Gumi Plant II (formerly KIET)
  - Anyang R&D Plant
  - Woomyum R&D Plant
- Hyundai Electronics
  - Semiconductor Plant I
  - Semiconductor Plant II
  - Semiconductor Plant III
  - Assembly and Test Plant
- Daewoo Telecommunications
- Korea Electronics Company
- Anam Industrial (assembly)

Fab/Foundry Data Base--South Korea

FOUNDRIES

The following companies are currently engaged in or offer foundry services. Descriptions include technologies, potential capacity for the foundry services, and current customers.

- Samsung Semiconductor and Telecommunications Co., Ltd.
  - Technology: NMOS, CMOS, bipolar
  - Capacity: 20,000 5-inch wafers per month
  - Customers: Intel
- Gold Star Semiconductor, Ltd.
  - Technology: NMOS, CMOS
  - Capacity: 20,000 5-inch wafers per month
  - Customers: LSI Logic, Fairchild Semiconductor
- Hyundai Electronics Industries, Co., Ltd.
  - Technology: NMOS, CMOS
  - Capacity: 5,000 5-inch wafers per month
20,000 6-inch wafers per month
  - Customers: Texas Instruments, Vitelic, General Instrument
- Daewoo Telecommunications, Semiconductor Division
  - Technology: Bipolar, CMOS
  - Capacity: 4,000 4-inch wafers per month
  - Customers: Ricoh, ZyMOS

Table 1

Fabrication Facilities Data—South Korea

Company/Plant	Start-Up of Production Facilities	Name of Representative	Employees (1987)	Floor Space (Thousands of Square Feet)	Operations: Fab	Operations: Assembly	Operations: Test
Samsung Semiconductor and Telecommunications							
Buchon Plant	Dec. 1974	J.S. Won	2,650	260	X	X	X
Kiheung Plant	April 1984	Y.W. Lee	2,000	1,000*	X		X
Samsung Semiconductor, Inc. (United States)	July 1983	S.J. Lee	310	100	X		X
Gold Star Semiconductor							
Gumi Bipolar Plant I	Feb. 1980	D.H. Song	1,000	200	X	X	X
Gumi MOS Plant I	Sep. 1984	D.H. Song	500	200	X		X
Anyang R&D Plant	Nov. 1984	M.S. Choi	400	100	X		X
Hyundai Electronics							
Semiconductor I	Oct. 1984	K.H. Oh		150	X		X
Semiconductor II	Jul. 1985	K.H. Oh	2,000**	170	X		X
Semiconductor III	Sept. 1985	K.H. Oh		50			
Assembly and Test Plant	April 1985	Y.Y. Rha		780		X	X
Daewoo Telecommunications, Semiconductor Division	Sept. 1986	H.J. Chang	300	140	X		X
Korea Electronics	March 1970	D. Chang	2,980	250	X	X	X
Anam Industrial	May 1972	J.C. Kim	9,700	280		X	X

Company/Plant	Product/Technology: Bipolar Memory	Bipolar Logic	MOS Memory	MOS MPU	MOS Logic	Linear	Transistors	Diodes	Optoelectronic	ASIC
Samsung Semiconductor and Telecommunications										
Buchon Plant		X		X	X	X	X	X		X
Kiheung Plant			X		X					X
Samsung Semiconductor, Inc. (United States)			X	X	X					
Gold Star Semiconductor										
Gumi Bipolar I		X				X	X			
Gumi MOS I			X	X	X					X
Anyang R&D Plant			X	X	X					X
Woomyum R&D Plant		X	X	X	X	X				
Hyundai Electronics										
Semiconductor I			X	X	X					
Semiconductor II			X							X
Semiconductor III			X							
Assembly and Test Plant										
Daewoo Telecommunications, Semiconductor Division		X		X	X	X				X
Korea Electronics		X				X	X	X	X	
Anam Industrial										

(Continued)

Table 1 (Continued)

Fabrication Facilities Data—South Korea

Company/Plant	Capacity (Wafers/Month) 1984	1985	1986	1987	Average Wafer Size (Inches)	Production (Millions of Units/Month) 1983	1984	1985	Capital Spending (Millions of U.S. Dollars) 1984	1985	1986	1987	CAD CPUs	CAD Workstations
Samsung Semiconductor and Telecommunications														
Buchon Plant	30,000	50,000	45,000	45,000	4, 5	376.5	693.3	820	$ 52	$ 60	$30	$30	1	3
Kiheung Plant	27,000	47,000	55,000	70,000	4, 6	N/A	18.1	25	$124	$160	$97	$90	2	8
Samsung Semiconductor, Inc. (United States)	4,000	6,000	10,000	10,000	5	N/A	N/A	N/A	$ 15	$ 20	$25	$10	1	3
Gold Star Semiconductor														
Gumi Plant I	28,000	28,000	28,000	28,000	4, 5	80	125	190	$112	$107	$90	$89	1	2
Gumi Plant II	N/A	N/A	15,000	15,000	4	N/A	N/A	N/A					1	2
Anyang R&D Plant	9,000	10,000	10,000	10,000	5	N/A	N/A	5				$36	1	4
Hyundai Electronics														
Semiconductor I	N/A	15,000	15,000	15,000	5	N/A	N/A	10						
Semiconductor II	N/A	25,000	25,000	25,000	6	N/A	N/A	N/A	$138	$141	$43	$48	2	6
Semiconductor III			4,200		5	N/A	N/A	N/A						
Assembly and Test Plant	N/A	240,000	240,000	240,000	4, 5, 6	N/A	N/A	10						
Daewoo Telecommunications, Semiconductor Division	5,000	7,000	10,000	20,000	4	N/A	N/A	N/A	N/A	N/A	$25	$30	1	2
Korea Electronics	6,000	10,000	10,000	10,000	3, 4	75	129	170	$ 37	$ 22	$20	$ 6	1	2
Anam Industrial	500,000	800,000	1,000,000	1,000,000	3, 4, 5	70	100	150	$ 20	$ 60	$30	$25	N/A	N/A

Company/Plant	Wafer Fab: E-beam	Projection Aligners	Steppers	Contact Aligners	Diffusion Tubes	Ion Implanters	CVD	Epitaxy	Wet Etch	Plasma Etch	Sputtering Systems
Samsung Semiconductor and Telecommunications											
Buchon Plant	0	20	5	20	110	6	3	4	10	13	4
Kiheung Plant	1	22	43	0	100	11	5	0	0	30	6
Samsung Semiconductor, Inc. (United States)	0	3	4	0	30	2	1	0	0	4	2
Gold Star Semiconductor											
Gumi Bipolar I	0	12	7	5	65	5	5	3	5	5	4
Gumi MOS I	0	2	0	4	32	2	2	1	5	3	1
Anyang R&D Plant	0	3	8	0	65	3	2	0	0	7	3
Hyundai Electronics											
Semiconductor I	0	6	5	6	24	3	6	0	1	13	2
Semiconductor II	0	0	36	0	48	4	8	0	0	10	5
Semiconductor III											
Assembly and Test Plant	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Daewoo Telecommunications, Semiconductor Division	0	4	0	3	25	1	5	0	7	2	2
Korea Electronics	0	0	0	10	36	1	3	0	5	0	2
Anam Industrial	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(Continued)

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Table 1 (Continued)

Fabrication Facilities Data—South Korea

Company/Plant	Test: Memory Test	Test: IC Test	Test: LSI Test	Assembly: Wafer Probe	Assembly: Dicing Saw	Assembly: Die Bond	Assembly: Wire Bond
Samsung Semiconductor and Telecommunications							
Bochon Plant	0	5	4	-	-	-	-
Kiheung Plant	10	0	5	-	-	-	-
Samsung Semiconductor, Inc. (United States)	1	0	1	N/A	N/A	N/A	N/A
Gold Star Semiconductor							
Gumi Bipolar	1	4	2	-	-	-	-
Gumi MOS I	1	1	1	2	-	-	-
Anyang R&D Plant	3	0	1	N/A	N/A	N/A	N/A
Hyundai Electronics							
Semiconductor I	4	0	2	4	N/A	N/A	N/A
Semiconductor II	6	0	2	N/A	N/A	N/A	N/A
Semiconductor III	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Assembly and Test Plant	4	5	3	-	21	66	133
Daewoo Telecommunications, Semiconductor Division	0	1	0	2	N/A	N/A	N/A
Korea Electronics	0	1	0	-	-	-	-
Anam Industrial	-	-	-		8,000 units**		

N/A = Not Applicable
- = Unavailable
X = Performed or produced at this facility

*The square footage given for floor space may include facilities other than those devoted to semiconductor manufacturing. For example, Samsung's Kiheung plant listing notes 1,000,000 square feet. This area includes engineering and support facilities.
**Combined totals may appear if companies do not provide breakdowns by individual plants. For example, in the Hyundai listing, one figure is given for employees: 2,000. This indicates that total employment for both the semiconductor plants and the assembly and test plant equals 2,000.
†Estimated

Source: Dataquest
October 1988

Fab/Foundry Data Base--Taiwan

FABRICATION FACILITIES

Table 1 represents a compilation of all available data on semiconductor production and assembly facilities of selected Taiwanese manufacturers.

Table 1

FABRICATION FACILITIES DATA--TAIWAN

Company/Plant	Start-Up of Production Facilities	Name of Representative	Employees (1986)	Floor Space (Thousands of Square Feet)	Operations Fab	Operations Assembly	Operations Test
The Electronics Research and Service Organization (ERSO)	Dec. 1977	C.T. Shih	1,800	286	X	X	X
United Microelectronics Corporation	April 1982	H.C. Tsao	833	92	X		X
Mectron							
Tu Chen Plant I	May 1976	Y.H. Chung		47	X	X	
Tu Chen Plant II	Sep. 1983	Y.H. Chung	1,000*	50		X	X
Tu Chen Plant III	April 1984	Y.H. Chung		47		X	X
Fine Products Microelectronics	July 1970	Fanson Kuo	350	N/A	X	X	X
Orient Semiconductor Electronics	July 1971	Y.C. Duh	800	55		X	X
Quosel**	Nov. 1985	C.N. Pai	100	1	X		X
Mosel**	April 1985	N.H. Tsai	14	-			

Company/Plant	Product/Technology Bipolar Memory	Bipolar Logic	MOS Memory	MOS MPU	MOS Logic	Linear	Transistors	Diodes	Optoelectronic	ASIC
The Electronics Research and Service Organization (ERSO)			X		X	X				
United Microelectronics Corporation			X							
Mectron										
Tu Chen Plant I										
Tu Chen Plant II								X		
Tu Chen Plant III										
Fine Products Microelectronics							X		X	
Orient Semiconductor Electronics										
Quosel**			X							
Mosel**			X							

(Continued)

Table 1 (Continued)

FABRICATION FACILITIES DATA--TAIWAN

Company/Plant	Capacity (Wafers/Month) 1984	1985	1986†	Wafer Size (Inches)	Average Production (Millions of Units/Month) 1983	1984	1985	Capital Spending (Millions of U.S. Dollars) 1984	1985	CAD CPUs	CAD Workstations
The Electronics Research and Service Organization (ERSO)	N/A	N/A	200,000	4	N/A	N/A	N/A	N/A	N/A	2	10
United Microelectronics Corporation	23,000	27,000	N/A	4	2.3	6.6	11.6	$ 5	$ 5	3	5
Mectron Tu Chen Plant I Tu Chen Plant II Tu Chen Plant III	150,000	150,000	200,000	1.5 2 2.5	51.1	87.9	53.2	$1.5	$2.5	0	0
Fine Products Microelectronics	-	-	N/A	3	-	-	-	$1.3	$0.5	0	0
Orient Semiconductor Electronics	-	-	-	3, 4, 5	4	5	6.5	$1.8	$2.2	N/A	N/A
Quosel**	-	-	-	4	-	-	-	-	$ 10	0	0
Mosel**	-	-	-	4	-	-	-	-	-	N/A	N/A

Company/Plant	Wafer Fab E-beam	Projection Aligners	Steppers	Contact Aligners	Diffusion Tubes	Ion Implanters	CVD	Epitaxy	Wet Etch	Plasma Etch	Sputtering Systems
The Electronics Research and Service Organization (ERSO)	1	2	3	7	48	2	2	0	1	2	2
United Microelectronics Corporation	0	6	4	8	36	13	7	0	30	3	3
Mectron Tu Chen Plant I Tu Chen Plant II Tu Chen Plant III	0*	2*	0*	0*	16*	0*	2*	0*	1*	0*	0*
Fine Products Microelectronics	1	0	0	3	14	0	1	0	4	1	0
Orient Semiconductor Electronics	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Quosel**	0	3	3	0	5	0	3	0	5	4	0
Mosel**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

(Continued)

Table 1 (Continued)

FABRICATION FACILITIES DATA--TAIWAN

Company/Plant	Test: Memory Test	Test: IC Test	Test: LSI Test	Assembly: Wafer Probe	Assembly: Dicing Saw	Assembly: Die Bond	Assembly: Wire Bond
The Electronics Research and Service Organization (ERSO)	3	2	19	48	1	0	0
United Microelectronics Corporation	3	27	28	N/A	N/A	N/A	N/A
Rectron Tu Chen Plant I Tu Chen Plant II Tu Chen Plant III	0	0	0	1	15	1	1
Fine Products Microelectronics	0	0	0	15	5	10	40
Orient Semiconductor Electronics	0	7	0	N/A	4	7	52
Quosel**	3	2	0	N/A	N/A	N/A	N/A
Mosel**	N/A	N/A	N/A	N/A	N/A	N/A	N/A

N/A = Not Applicable
- = Unavailable
X = Performed or produced at this facility

*Combined totals may appear if companies do not provide breakdowns by individual plants. For example, in the Rectron listing, one figure is given for employees: 1,000. This indicates that total employment for all three Rectron plants equals 1,000.
**Mosel was UMC's foundry. It provided designs for UMC and UMC produced the products for Mosel. UMC sells 50 percent of these products and Mosel sells 50 percent. Quosel uses its own equipment to manufacture products at UMC's factory. Both Mosel and Quosel are small-quantity production companies.
†Estimated

Source: Dataquest
March 1987

Fab/Foundry Data Base--Hong Kong

FABRICATION FACILITIES

Table 1 presents a compilation of all available data on semiconductor production and assembly facilities of selected Hong Kong manufacturers. The following companies are described in the facilities chart:

- Elcap Electronics
- Hua Ko Electronics
- RCL Semiconductors

FOUNDRIES

Hong Kong does not have this supporting industry available to the semiconductor industry, hence no information can be provided.

Table 1

FABRICATION FACILITIES DATA--HONG KONG

Company/Plant	Start-up of Production Facilities	Name of Representative	Employees	Floor Space (Square Feet)	Operations: Fab	Assembly	Test
Elcap Electronics	1982	David Yung	500	70,000	X	X	X
Hua Ko Electronics Co.	1982	Y.C. Nung	450	56,000	X	X	X
RCL Semiconductors	March 1982	S.C. Isui	280	100,000	X	X	X

Company/Plant	Product/Technology: Bipolar Memory	Bipolar Logic	MOS Memory	MOS MPU	MOS Logic	Linear	Transistor	Diode	Optoelectronics	Capacity (Wafers/Month): 1983	1984	1985
Elcap Electronics	-	-	X	X	X	X	-	-	-	5,000	8,000	100,000
Hua Ko Electronics Co.	-	-	X	X	X	X	-	-	-	2,000	3,000	4,500
RCL Semiconductors	-	-	X	X	X	X	X	-	-	4,000	8,000	4,000

Company/Plant	Average Production (Thousands of Units/Month): 1982	1983	1984	Capital Spending (Millions of Dollars): 1983	1984	1985	CAD: CPU	Workstation	Wafer Fab: E-Beam	Projection Aligners	Steppers	Contact Aligners	Diffusion Tubes
Elcap Electronics	30,000	6,000	8,000	$40	$75	$85	1	6	1	5	2	3	20
Hua Ko Electronics Co.	-	4,000	5,000	$30	$45	$55	1	4	0	2	0	2	16
RCL Semiconductors	2,000	4,000	5,000	$20	$30	$45	2	4	2	4	2	5	32

Company/Plant	Wafer Fab: Ion Implanters	CVD	Epitaxy	Wet Etch	Plasma Etch	Sputtering Systems	Test: Memory Test	IC Test	LSI Test	Wafer Probe
Elcap Electronics	2	4	2	5	-	1	1	1	1	4
Hua Ko Electronics	2	2	1	2	2	-	1	1	1	2
RCL Semiconductors	2	4	-	3	2	2	1	1	1	1

- = Unavailable

Source: Dataquest
March 1987

Fab/Foundry Data Base--Singapore

FABRICATION FACILITIES

Table 1 presents data about the only wafer fabrication facility in Singapore—SGS Semiconductor. Tables 2 and 3 present data about SGS's two assembly and test facilities in the Singapore region. Two additional fabrication facilities will be established by other companies by the end of 1987.

FOUNDRIES

Singapore does not have this supporting industry available to the semiconductor industry, hence no information can be provided.

Table 1

Fabrication Facilities Data—Singapore

Company/Plant	Start-up of Production Facilities	Name of Representative	Employees	Floor Space (Square Feet)	Operations: Fab	Operations: Assembly	Operations: Test
SGS Semiconductor (Ang Mo Kio)	Oct. 1984	Antony Watts Strategic Planning Director	300	14,000	X	-	-

Company/Plant	Product/Technology: Bipolar Memory	Bipolar Logic	MOS Memory	MOS MPU	MOS Logic	Linear	Transistor	Diode	Optoelectronics	Capacity (Wafers/Month): 1984	1985	1986	1987	Wafer Size (Inches)
SGS Semiconductor	-	-	-	-	-	X	X	-	-	-	15K	22K	25K	5

Company/Plant	Average Production (Millions of Units/Month): 1984	1985	1986	Capital Spending (Millions of Dollars): 1984	1985	1986	CAD: CPU	CAD: Workstation	Wafer Fab: E-Beam	Projection Aligners	Steppers	Contact Aligners	Diffusion Tubes
SGS Semiconductor	N/A	N/A	N/A	$35	$20	$15	2	4	-	X	-	X	X

Company/Plant	Wafer Fab: Ion Implanters	CVD	Epitaxy	Wet Etch	Plasma Etch	Sputtering Systems	Test: Memory Test	IC Test	LSI Test	Wafer Probe
SGS Semiconductor	X	X	X	X	X	-	-	-	-	X

N/A = Not Available

Source: Dataquest
November 1987

Table 2

Fabrication Facilities Data—Singapore

Company/Plant	Start-up of Production Facilities	Name of Representative	Employees	Floor Space (Square Feet)	Operations: Fab	Operations: Assembly	Operations: Test
SGS Semiconductor (To Payoh)	1969	Antony Watts Strategic Planning Director	1,400	125,000	-	X	X

Company/Plant	Product/Technology: Bipolar Memory	Bipolar Logic	MOS Memory	MOS MPU	MOS Logic	Linear	Transistor	Diode	Optoelectronics	Capacity (Wafers/Month): 1984	1985	1986	Wafer Size (Inches)
SGS Semiconductor	-	X	X	X	X	X	-	-	-	-	-	-	-

Company/Plant	Average Production (Millions of Units/Month): 1984	1985	1986	Capital Spending (Millions of Dollars): 1984	1985	1986	CAD: CPU	Workstation	Wafer Fab: E-Beam	Projection Aligners	Steppers	Contact Aligners	Diffusion Tubes
SGS Semiconductor	N/A	N/A	N/A	$5	$10	0	-	-	-	-	-	-	-

Company/Plant	Wafer Fab: Ion Implanters	CVD	Epitaxy	Wet Etch	Plasma Etch	Sputtering Systems	Test: Memory Test	IC Test	LSI Test	Wafer Probe
SGS Semiconductor	-	-	-	-	-	-	X	X	X	-

N/A = Not Available

Source: Dataquest
November 1987

Table 3

Fabrication Facilities Data—Singapore

Company/Plant	Start-up of Production Facilities	Name of Representative	Employees	Floor Space (Square Feet)	Operations: Fab	Operations: Assembly	Operations: Test
SGS Semiconductor Mwar (Malaysia)	1974	Antony Watts Strategic Planning Director	1,800	160,000	-	X	X

Company/Plant	Product/Technology: Bipolar Memory	Bipolar Logic	MOS Memory	MOS MPU	MOS Logic	Linear	Transistor	Diode	Optoelectronics	Capacity (Wafers/Month): 1984	1985	1986	Wafer Size (Inches)
SGS Semiconductor	-	-	-	-	-	-	-	-	-	-	-	-	-

Company/Plant	Average Production (Millions of Units/Month): 1984	1985	1986	Capital Spending (Millions of Dollars): 1984	1985	1986	CAD: CPU	CAD: Workstation	Wafer Fab: E-Beam	Projection Aligners	Steppers	Contact Aligners	Diffusion Tubes
SGS Semiconductor	N/A	N/A	N/A	$15	$20	$10	-	-	-	-	-	-	-

Company/Plant	Wafer Fab: Ion Implanters	CVD	Epitaxy	Wet Etch	Plasma Etch	Sputtering Systems	Test: Memory Test	IC Test	LSI Test	Wafer Probe
SGS Semiconductor	-	-	-	-	-	-	X	X	X	-

N/A = Not Available

Source: Dataquest
November 1987

Fab/Foundry Data Base—China

FABRICATION FACILITIES

Tables 1 and 2 present compilations of all available data on semiconductor production and assembly facilities of selected Chinese manufacturers.

Table 1

FABRICATION FACILITIES DATA--CHINA

Location	Facility	Products	Type	Partner
Beijing	Beijing Electric Tube Factory	LF PRW	N/A	N/A
	Beijing Electric Tube Factory 774	Linear	N/A	N/A
	Beijing Semiconductor Factory 2	TTL 74HS, INTFC, bipolar digital	N/A	N/A
	Beijing Semiconductor Factory 3	CMOS, IBMCU, HTL, WATCH IC, MOS logic	N/A	N/A
	Beijing Semiconductor Factory 5	PMOS, CMOS, hybrid, OPAMP, MOS logic, linear	N/A	N/A
	Beijing Semiconductor Factory 6	TTL MSI, SSI, bipolar digital		
	Beijing Semiconductor Institute	Linear, OPAMP		
	China Electronic Components Corp.	N/A	N/A	N/A
	Dongguang Electronic Equipment Plant	TTL HS/MOS, CMOS, NMOS, 4BMPU, bipolar digital, MOS logic	N/A	N/A
Changsha	Shaoguang Electronics Factory	Chrome masks	N/A	N/A
	Shaoguang Electronic Equipment Plant	LSTTL, amps, INTFC, bipolar digital, linear	N/A	N/A
Changzhou	Changzhou Semiconductor Plant	LSTTL, CMOS, 8080, INTFC, bipolar digital, MOS logic, linear	N/A	N/A
Chengdu	Chengdu Electronic Components Co.	Linear, disk, diodes, transistors	N/A	N/A
Duyan	Fengguang Electronic Equipment Plant	OPAMP, ACUS SENS, linear	N/A	N/A
Guangdong	Foshan Electronics Co.	Disk, IC, diodes, transistors, bipolar digital	JV	N/A
Guangzhou	Guanzhou Xianda Co.	LF PRW, LSI IC, MOS logic, transistors	JV	N/A
Hangzhou	Zhejiang Radio Factory	Linear, bipolar digital	N/A	N/A
Jixi, Anhui	Shanghai Plant 8331	TTL, OPAMP, PWR, linear, bipolar digital transistors	N/A	N/A
Kaili	Yonghong Electronic Equipment Plant	TTL HS/MS, bipolar digital	N/A	N/A
Liaoning	Dandong Electronics Main Factory	RF XSTR, transistors	N/A	Crow Electronics
Mingxi	Fujian Plant 8430	SCHM, MONOSTB TRIG	N/A	N/A
N/A	Min Machinery Industry	PWR, CMOS, transistors, MOS logic	TA	GE Corporation
Nanchang	Jiangnan Material Factory	CMOS, hybrid, MOS logic, linear	N/A	N/A
Nanjing	Nanjing Semiconductor Plant	TTL, linear, bipolar digital	N/A	N/A
Nantong	Nantong Transistor Plant	PMOS, HTL, INTFC, MOS logic, linear	N/A	N/A
Shaoxing	Tianguang Electronics	ECL, LSTTL, bipolar digital	N/A	N/A
	Yonghong Equipment Plant	Linear	N/A	N/A

(Continued)

Table 1 (Continued)

FABRICATION FACILITIES DATA--CHINA

Location	Facility	Products	Type	Partner
Shandong	Jinan Semiconductor Plant	OPAMP, ANLG MULT, linear	N/A	N/A
Shandong	Qingdao Semiconductor Institute	OPAMP, linear	N/A	N/A
Shanghai	Shanghai Plant 19	CMOS, MOS logic	TA	National Semiconductor
		CMOS, MOS logic	TA	SSS
	Shanghai Parts Plant 5	CMOS, PMOS, 8080, MOS logic, MOS memory	N/A	N/A
	Shanghai R&D Plant 14	CMOS, 4 to 8 BMPU, MOS logic	N/A	N/A
	Shanghai R&D Plant 19	TTL 74HS, 8080, INTFC, bipolar digital, linear	N/A	N/A
	Shanghai R&D Plant 7	TTL 74HS, OPAMP, PWR, bipolar digital, linear, transistors	N/A	N/A
Suzhou	Suzhou Semiconductor Plant	TTL, CMOS, OPTOCPL, bipolar digital, MOS logic, opto	N/A	N/A
Tianjin	Tianjin Factory	XSTR, diodes, transistors	N/A	Fuji Electric
	Tianjin Semiconductor Plant	TTL MSI, SSI, ACUS IC, bipolar digital	N/A	N/A
Wuxi	Jiagnan R&D and Material Factory	CTV IC, linear	TA	Japan/U.S. Cos.
	N/A	Television ICs, linear	JV	Toshiba
	Wuxi R&D Parts Plant	IC, PWR, INTFC, linear, transistors	N/A	N/A
Xiamen	Xiamen Electronics Ent Co.	IC, linear	JV	N/A
	Xiaxing Electronics Co.	Television ICs, linear	JV	N/A
Yangzhou	Yangzhou Transistor Plant	DARL, OPAMP, PWR, linear, transistors	N/A	N/A

N/A = Not Available

Source: Dataquest
August 1987

Table 2

SEMICONDUCTOR FACTORIES—CHINA
(70 Percent of Total)

							Device Manufacturers						
	Fab	Assembly	Test	3-inch Wafers	4-inch Wafers	Ion Implanters	Transistors	Diodes	Linear	Digital	MOS Logic	MOS Memory	Fab Capacity (Units)
Shanghai													
Factory Number 5	X	X	X	X	N/A	X	X	X	X	X	X	N/A	N/A
Factory Number 7	X	X	X	X	N/A	X	N/A	N/A	X	X	N/A	N/A	N/A
Factory Number 14	X	X	X	X	X	X	X	X	N/A	X	X	N/A	N/A
Factory Number 19	X	X	X	X	X	N/A	X	X	X	X	X	N/A	N/A
Watch Factory Number 5	X	N/A	X	X	N/A	N/A	N/A	N/A	N/A	N/A	X	N/A	N/A
Watch Factory Number 10	X	N/A	X	X	X	N/A	N/A	N/A	N/A	N/A	X	N/A	N/A
Shanghai Metallurgical	X	N/A	X	X	X	X	X	N/A	X	X	X	X	N/A
Fudan University	X	N/A	X	X	X	X	N/A	N/A	N/A	X	X	N/A	N/A
Wuxi	X	X	X	X	X	X	X	X	X	X	X	X	N/A
Beijing													
Tube Number 1 Factory	X	X	X	X	X	X*	X	X	X	X	X	N/A	N/A
Tube Number 2 Factory	X	N/A	N/A	N/A	N/A	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Beijing Semiconductor Factory Number 5	X	X	X	X	N/A	X	X	N/A	X	X	X	N/A	N/A
Beijing Semiconductor Factory Number 3	X	X	X	X	N/A	N/A	X	N/A	X	X	X	X	N/A
Tianjin													
Factory Number 1	X	X	X	N/A	N/A	X	N/A	N/A	X	N/A	N/A	N/A	N/A
Factory Number 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Factory Number 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Factory Number 4	X	X	X	N/A	N/A	N/A	N/A	N/A	X	N/A	N/A	N/A	N/A
Jinan													
Factory Number 1	X	N/A	N/A	X	N/A	N/A	N/A	N/A	X	X	N/A	N/A	N/A
Factory Number 2	X*	N/A	N/A	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Fuchou	X	X	X	X	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

*Scheduled
N/A = Not Available
X = Performed or produced at this facility

Source: Dataquest
August 1987